Men in the Air *by* J. EDGAR HOOVER

POPULAR AVIATION

Army Flight to South America

by LT.-COL. ROBERT OLDS
Flight Commander

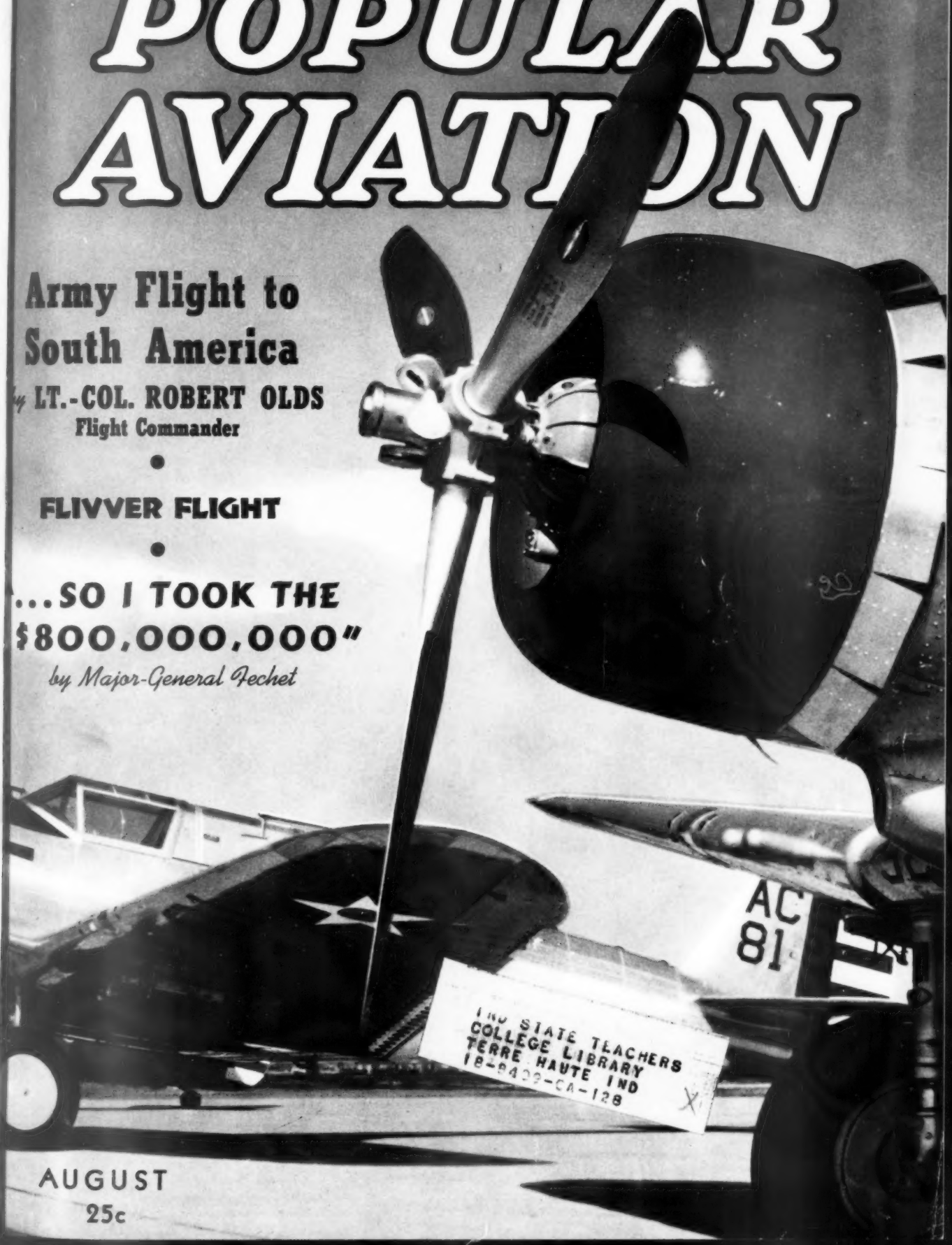
•

FLIVVER FLIGHT

•

...SO I TOOK THE $800,000,000"

by Major-General Fechet



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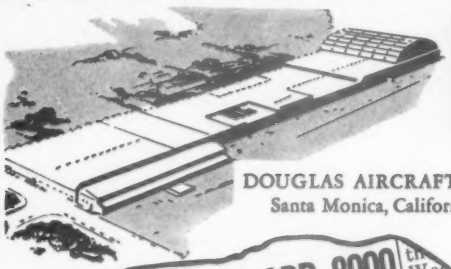
LEARN AVIATION IN LOS ANGELES



DOUGLAS AIRCRAFT CO.
Santa Monica, California

CONTRACT TO ADD 8000 MEN TO LOS ANGELES AIRCRAFT PAYROLL

Insuring employment for an additional 8000 men, a government contract was issued to Douglas Aircraft Company, of Santa Monica (Los Angeles County), California, by the War Department for 37 large transport planes.

JOBS FOR 8000

This huge order, stated a Douglas official, means increased prosperity for Southern California's aviation industry, with good wages going to an additional 8000 men. This increase in employes added to the usual Douglas payroll will bring employment in the great Douglas plant to an all-time record high.

CALIFORNIA FLYERS offers greater employment opportunity, lower cost training in world's aviation center

HERE IS JUST ONE EXAMPLE — A daily newspaper forcibly demonstrates to ardent young men that the real opportunity in industry today is in aviation at Los Angeles. 8000 new positions in one aviation plant alone is a record unparalleled by any other business—and this is the story of but one of the nine prospering aircraft plants in Los Angeles. You won't find any place in the world where there is so much employment for aircraft builders, draftsmen, mechanics and pilots. It is only natural that here in Los Angeles is located one of the finest aviation schools in America for here the demand for trained men in all of these fields is greatest. You need proper training to secure one of these good-paying positions in the aviation industry. You can get America's finest training and at a lower cost by actual comparison at California Flyers.

FREE TRANSPORTATION TO LOS ANGELES

California Flyers makes it possible for you to learn here in the aviation center of the world by paying the complete cost of student's transportation to Los Angeles from any point in the United States.

California Flyers is the only school making this offer. Living is cheaper in Southern California by government records. Favorable climatic conditions allow you to finish your training quicker. The result of these advantages, plus lower tuition and plus free transportation, means you will start learning more quickly and with less expense.

Los Angeles' Only U.S. Government Approved School Offering Both Flying and Mechanics

You young men who want a career in aviation should consider the outstanding advantages California Flyers offers you in strategic location and practical, lower-cost training... The advantages of training in Los Angeles are overwhelmingly important and beneficial to young men who want employment **right after graduation.** We can't tell you in the small space of one advertisement about the unbelievable amount of aviation activity and opportunity for you right around our field. But there are more commercial, private and military planes flying and more planes manufactured than in any other place in the World. There is more testing of all these planes on our field by the U. S. Bureau of Air Commerce than in any other place in the world. Think of the opportunity for you in this tremendous amount of activity! Think of the advantages of taking your training at California Flyers in the very hub of the aviation world.

Send for our catalog to get a comprehensive picture of opportunity for you in Los Angeles and a complete description of California Flyers practical, lower-cost flying and mechanics training courses.

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LOS ANGELES MUNICIPAL AIRPORT, INGLEWOOD, CALIFORNIA

LOCATED IN THE AVIATION CENTER OF THE WORLD
Only U.S. Government Approved Los Angeles Aviation School Offering Both Flying and Mechanical Courses • Highest U. S. Government Approval • America's Most Modern Aviation School

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More Than "A Place to Learn to Fly"

PARKS

Offers You

A College Education Specializing in Aviation

SEVERAL HOURS PRIOR to the time of departure, teletype weather reports are scanned critically.

THE thoroughness of Parks training amazes visitors. Much more than "just a place to learn to fly," Parks Air College gives you a complete, well rounded, education in every phase of aviation theory, practice and technique.

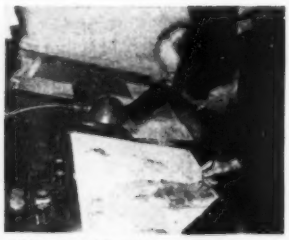
The remarkable placement record of Parks graduates is the result of the thorough, practical training provided and the high standards of performance maintained in four major courses: PROFESSIONAL FLIGHT AND EXECUTIVE COURSE — AVIATION OPERATIONS AND EXECUTIVE COURSE — MAINTENANCE ENGINEERING COURSE — AERONAUTICAL ENGINEERING COURSE.

Students Operate Air Transport Line —

Students in the Professional Flight and Executive Course and Aviation Operations and Executive Course actually operate a scheduled air transport line as part of their training at Parks. Flights are made by day, by night, and by instrument, between Parks Airport and Indianapolis. All regular airline positions are assigned to class members, each student holding each position during the project. Every Professional Flight and Executive student serves as First Flight Officer on three trips—by day, by night, and by instruments.

So, when you enter one of the two Schools that provide training in Airline Operations you not only learn *about* airline operations—*you actually participate in them*. The unposed pictures at the left show some of the activities in this training project. They illustrate what is meant by *practical training* at Parks.

THE METEOROLOGIST is assembling weather data in the form of a weather map, and he is making a weather forecast for the flight.



THE NAVIGATION OFFICER for the day is consulting the weather map in making out the flight plan.

HERE THE NECESSARY FORMS incident to the flight are being made up and checked.

THE CREW FOR THE FLIGHT is making a final checkup prior to takeoff.

BY RADIO, ship to ground contacts are maintained providing information relative to weather, position and altitude.

If you want success, if you want aviation education of proven value, get the facts about Parks Air College. Send coupon for free 60-page catalog and outline of four major courses, today.

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Whether you enter for Professional Flight—Aviation Operations —Maintenance Engineering or Aeronautical Engineering, you have the advantage of practical training. A wealth of equipment —$2,299.00 worth for each of the 280 students in school—makes this possible. Training that is practical and comprehensive, together with the standards maintained, assures a ready acceptance of graduates. All of them during the past four years, with the exception of only five, made good connections at the time of, or shortly following graduation—some being placed even before graduation.

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East St. Louis, Illinois **Section PA-8**

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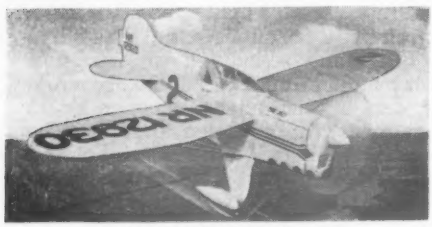
New TAYLOR CUB
Span, 79½" Length, 50"
A sensational flyer. A beauty, in yellow with red trim. Complete kit, a real buy at. **$8.50**



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Approved by Art Chester
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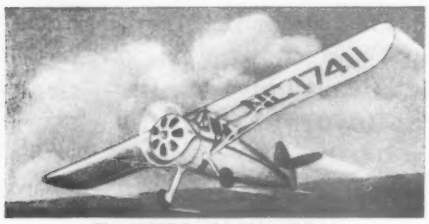
An ideal flying gas model of Art Chester's classy racer in cream with dark green trim. Complete kit, for only..... **$12.00**



The LUSCOMBE PHANTOM
Approved by the Luscombe Airplane Corp.
Span, 6'4" Length, 51"
All the latest improvements tend to make this an outstanding flyer. Yellow with red trim gives it a striking appearance. Price, only..... **$14.00**

IMPORTANT NOTE!

These kits are ABSOLUTELY COMPLETE, except for motor. Get any one of them and eliminate the necessity of having to buy a lot of extra parts. Each kit contains: all movable controls; ready formed landing gear and motor mount; spun alum. cowl—where necessary; new type, streamline, puncture-proof, rubber tired wheels; FULL SIZE BLUE PRINTS; license numbers and authentic markings; sheet aluminum; semi-finished wheel pants on models shown; leading and trailing edges tapered to shape on tapered wing models; all liquids (including colors); switches, bolts, screws, etc., and the majority of curved parts cut to shape; such as ribs, forms, wing-tips, etc. Such completeness will enable you to build a *finer* gas model.

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The REARWIN Speedster
Span, 6' Length, 3'6"
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Approved by the Stinson Aircraft Corp.
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A snappy job in black and yellow, with plenty of wing surface, to make it glide in slowly. This de luxe kit, priced at..... **$14.50**

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A trim single seater pursuit job. Complete kit, with balsa air wheels. Only. **$6.50**

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HOWARD D.G.A.-8	☐	SILVER FLYER	☐
REARWIN SPEEDSTER	☐	U. S. ARMY PURSUIT	☐
MONOCOUPE 90-A	☐	NEW TAYLOR CUB	☐
THE HAWK	☐	LUSCOMBE PHANTOM	☐

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☐ Enclosed $1.00 deposit. Balance C.O.D. plus slight postage charges.
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ADDRESS .....
CITY & STATE.....
Note: West of Mississippi, and Canada, add 10%. Foreign 15%. Add 50c to cover mailing costs on each kit.

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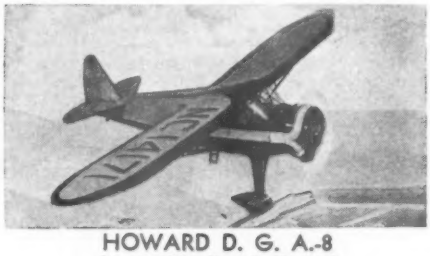
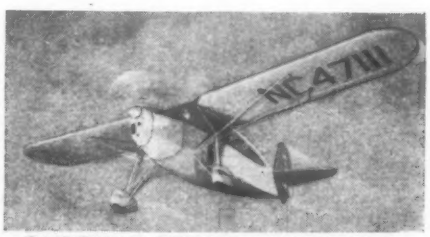
Span, 72" Length, 52"
Trim, sleek, stable flyer of the late Capt. Page, famous racer. Regulation Navy Blue and Orange. Buy now, only..... **$10.00**

U. S. ARMY PURSUIT
Span, 57" Length, 48"
A knobby, stable, and consistent flyer, in blue, with army yellow wings. Complete kit, including colored army insignia, only..... **$8.00**



HOWARD D. G. A.-8
Approved by Ben. O. Howard
Span, 6'4" Length, 51"
A great gas model of a great flyer, in a rich orange and black combination. Complete kit, can't be beat at this price..... **$12.50**



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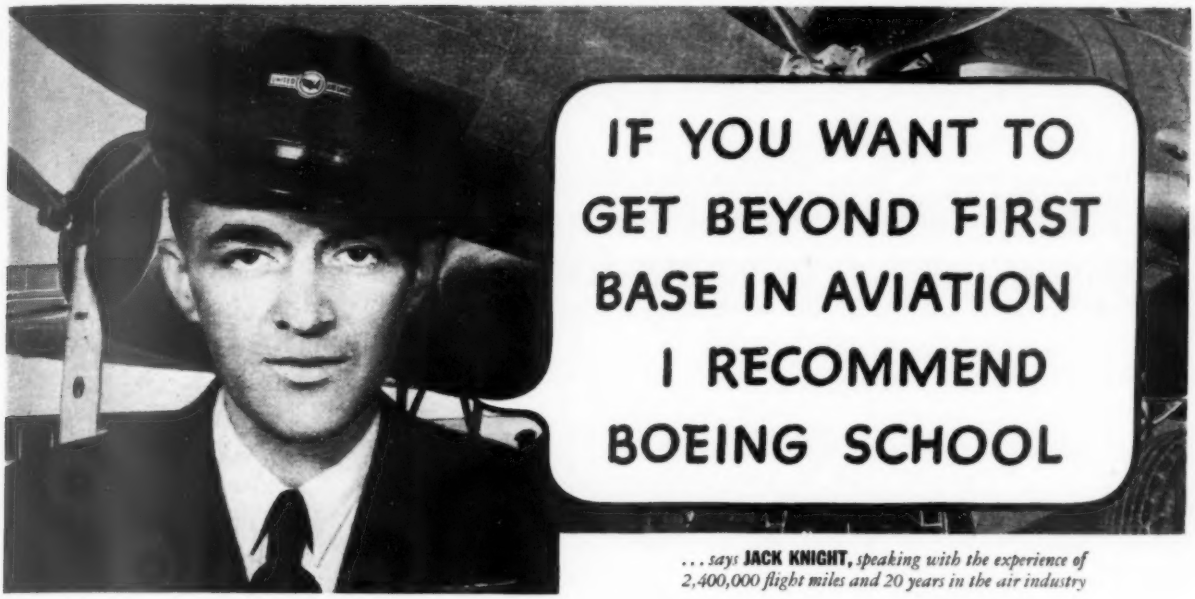

. . . says **JACK KNIGHT,** *speaking with the experience of 2,400,000 flight miles and 20 years in the air industry*

***The most experienced air line in the world founded and maintains Boeing School of Aeronautics . . . to assure aviation a reliable source of trained young men*—career men**

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(May 1937—April 1938)

Months	*Number Graduated*	*Number Placements*	*No. Co.'s Employing Graduates*
1937			
May	1	16	6
June	34	14	8
July	5	7	2
Aug.	4	2	2
Sept.	20	17	7
Oct.	4	3	2
Nov.	2	2	2
Dec.	29	7	3
1938			
Jan.	7	14	6
Feb.	1	9	7
Mar.	40	16	6
Apr.	6	13	3
TOTAL	153	120	29

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- ☐ Private *(or)* Solo Pilot
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- ☐ Airline Mechanic
- ☐ Aircraft Sheet Metal

Courses requiring 2 yrs. pre-eng.:
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- ☐ Practical Aeronautical Engineering
- ☐ Airline Flight Officer

Courses for engineering graduates only:
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- ☐ Dispatching and Meteorology

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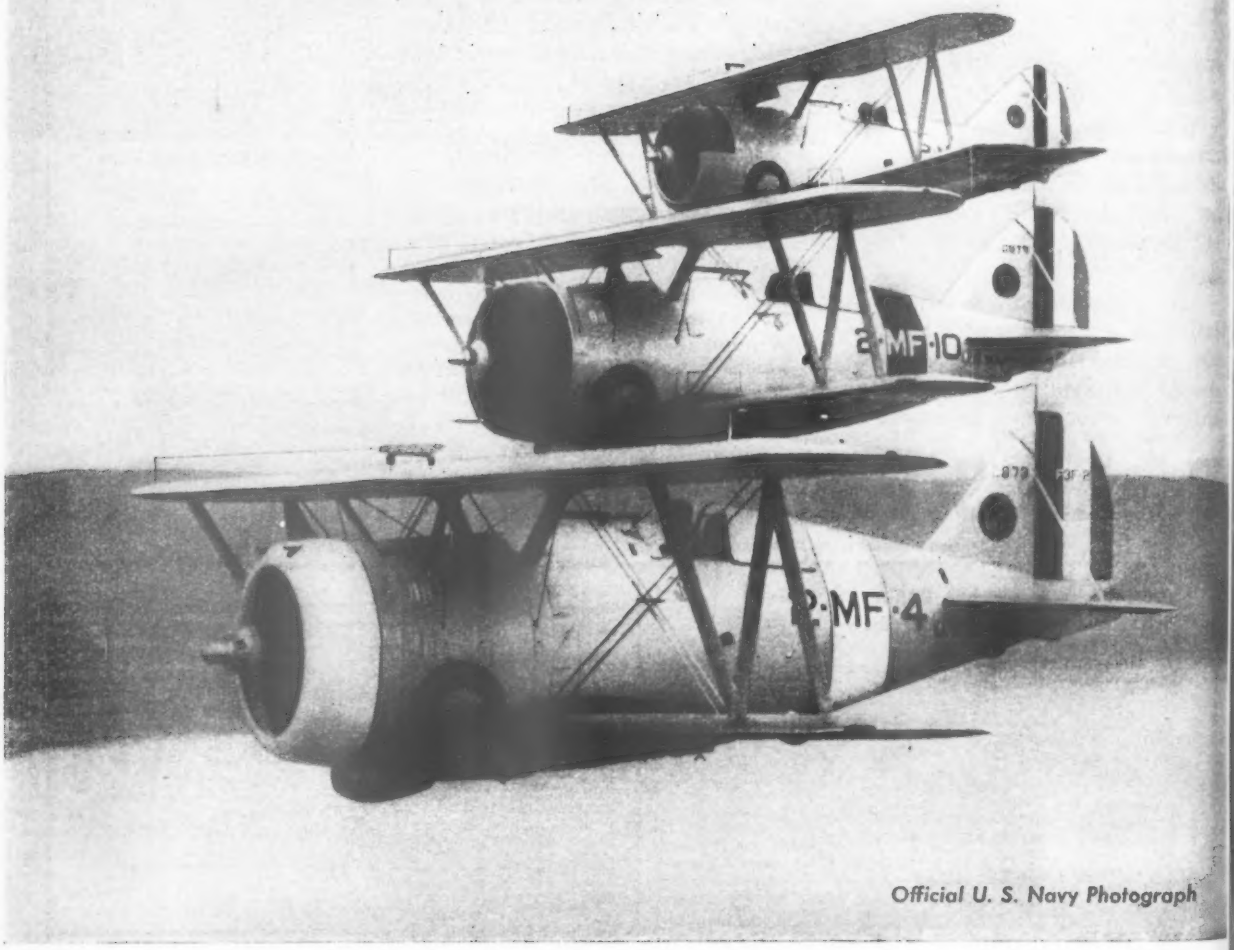
Two squadrons of these GRUMMAN F3F-2's are now in service with the United States Marine Corps.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION
Bethpage Long Island New York



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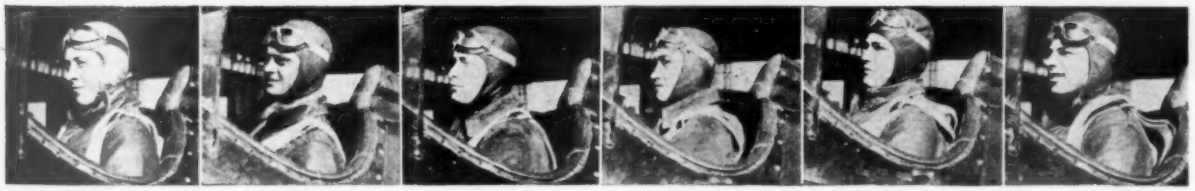
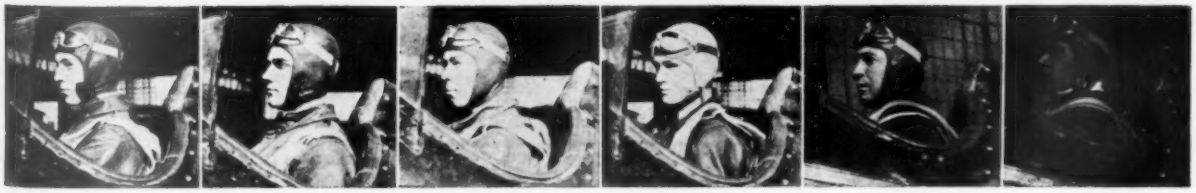
Ralph Westervelt, Trumansburgh, N. Y., PRIVATE
Jennie Tschoep, Wichita, Kan., MASTER TRANSPORT
Chin Lok, Canton, China, LIMITED COMMERCIAL

Frank Irizarry, San Jauan, Porta Rico, PRIVATE
Julio Rodriguez, Santurce, Porta Rico, LIMITED COMMERCIAL
Eddie Canille, Santa Rosa, Calif., LIMITED COMMERCIAL
Jackson Wing, Canton, China, LIMITED COMMERCIAL
Gentil da Rosa, Portuguese Colony, SPECIAL FLIGHT
Marciano Charpentier, San Jose, Costa Rica, SPECIAL FLIGHT



Myron Hilton, Freeport, Maine, MECHANIC'S FLIGHT
Tommie Godwin, Tonkawa, Okla., MASTER TRANSPORT
Walton Wilson, Josephine, N. D., ADVANCED ENGINE MECHANIC'S FLIGHT
Thomas Hannon, Oil City, Pa., ADVANCED ENGINE MECHANIC'S FLIGHT
John Pasquarello, Hialeah, Fla., ADVANCED ENGINE MECHANIC'S FLIGHT
Fred Mills, Surrey Center, B. C., ADVANCED ENGINE MECHANIC'S FLIGHT



Norman Snyder, Pittsburgh, Pa., ADVANCED ENGINE MECHANIC'S FLIGHT
Stanley Rankin, White Pine, Tenn., ADVANCED ENGINE MECHANIC'S FLIGHT
Lawrence McDonald, Bridgeport, W. Va., ADVANCED ENGINE MECHANIC'S FLIGHT
Roy Ledden, Sanford, S. C., ADVANCED ENGINE MECHANIC'S FLIGHT
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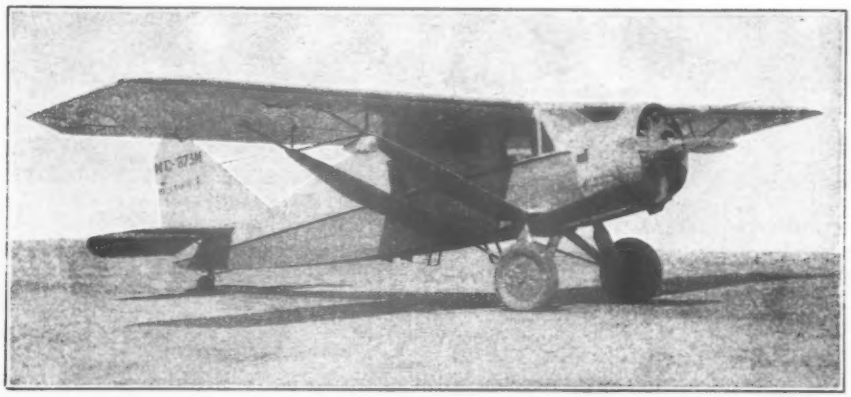
You learn to do things the better way here. You develop your ability to a fine point. You can't go wrong at Dallas—that's a fact.



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Love Field **Dallas, Texas**

Dallas Aviation School
Dallas, Texas

Please send your 1938 Catalog to

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State .....
Age .....

DESPITE the croaking of the crape-hangers, there has been very little damage done by lightning or atmospheric electricity. In fact, the damage to aircraft by lightning has been almost negligible while the destructive effects of atmospherics has been confined to balloons or other lighter-than-air craft.

It should be understood at this point that atmospheric electricity, due mostly to the friction of the wind, is a thing entirely apart from lightning caused by atomization of rain drops. Some atmospheric electricity exists at all times, widely spread at low potentials through the air, but lightning is due to small local concentrations dependent upon the humidity and barometric pressure.

Very fortunately, we have only five records of lightning actually striking a plane and but little damage was done in these five cases, the lightning leaving only a few scorched marks on the metal skin of the planes. This is quite remarkable when we consider the proximity of the plane to the charged clouds. Capacity flashes have taken place on other occasions to much smaller bodies than airplanes.

My principal reason for bringing up this subject in the Airy Chat is to collect more data from our readers upon trouble experienced from lightning and static by pilots on flying ships or damage by lightning at airports. We will greatly appreciate any items on the subject of lightning damage and will, particularly, be interested in pictures portraying this damage.

* * *

AND, in making this request, I am almost certain that some information on lightning will come rolling in. This belief is based upon many years experienced with our readers who have always displayed a most unusual spirit of cooperation. No matter what information has been requested in these col-

(*Concluded on page 79*)

POPULAR AVIATION

Volume XXIII AUGUST, 1938 Number 2

CONTENTS

FEATURES

Our Flight to South America	10
Ocean Giant	13
G-Men in the Air	14
Windmill Mail	17
The Best or the Most	18
Flivver Flight	22
A Town Goes Flying	25
The DC-4	28
That Man Weems	31
America Need Not Be Vulnerable	32
Hurricanes	35
West Point in the Air	36
Ice Cap Pilot	39
The Fairchild "24" (full page photograph)	41
". . . So I Took the $800,000,000.00"	42
Al Williams' New Grumman	45
Mr. Link Didn't Miss	46
Radium Express	49
Gob Fighter (full page photograph)	51
Personalities	52
Some Pilots Get All the Breaks	54
He Showed 'Em	55
Peruvian Wings	56
Laying Out Tapered Wings	59
The Latest in Ducks	61

Cover Photograph: Northrop A-17A's by N. R. Strohmeyer

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POPULAR AVIATION is published monthly by the Ziff Davis Publishing Company at 608 S. Dearborn St., Chicago, Ill. William B. Ziff, Publisher; B. G. Davis, Editor; John B. Rathbun, Managing Editor; Max Karant, Associate Editor; Swanee Taylor, Advertising Manager. Herman R. Bollin, Art Director. New York Office, 381 Fourth Ave. Subscription $2.50 per year; single copies, 25 cents; foreign postage $1.00 per year additional, except Canada. Contributors should retain a copy of contributions. All submitted material must contain return postage. Contributions will be handled with reasonable care, but this magazine assumes no responsibility for its safety. Accepted material is subject to whatever revisions necessary to meet requirements. Payment will be made at our current rates upon acceptance and, unless otherwise specified by the contributor, all photographs and drawings will be considered as constituting a part of the manuscript in making payment.

OUR FLIGHT

We proudly present this scoop to our readers. The author, one of the Army's aces, led this amazing flight and has written his version of that adventure exclusively for POPULAR AVIATION.

By

Lieutenant-Colonel

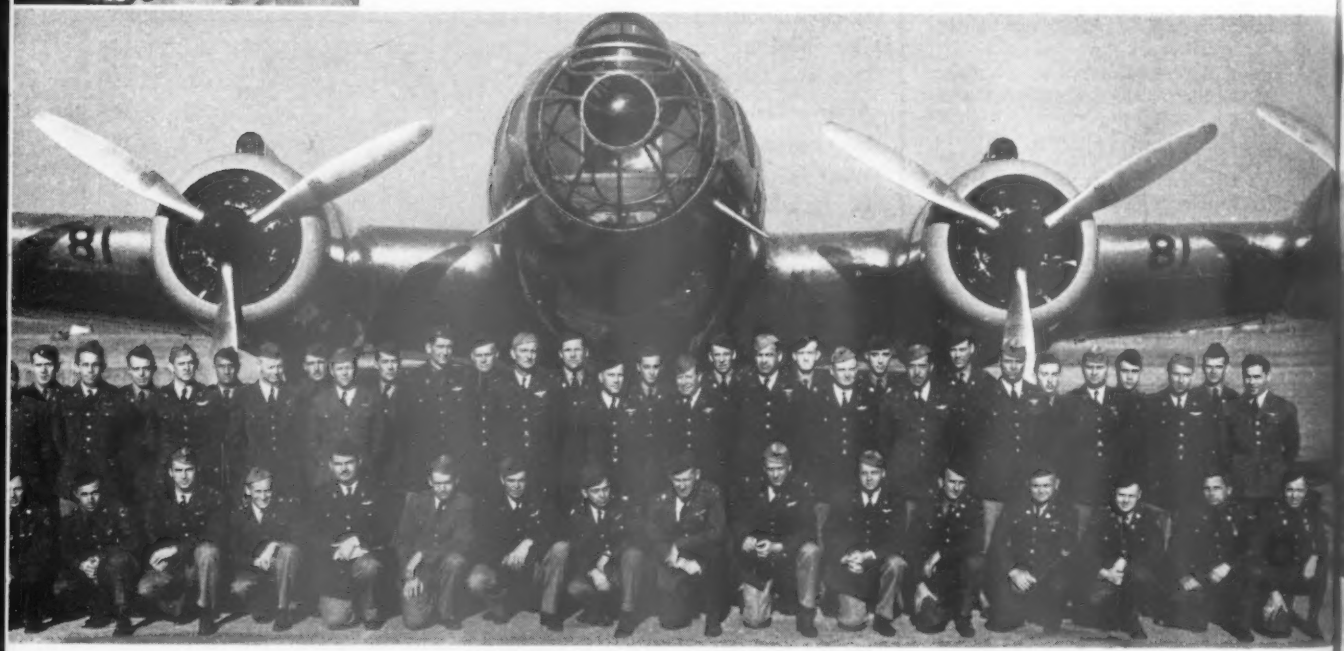
ROBERT OLDS

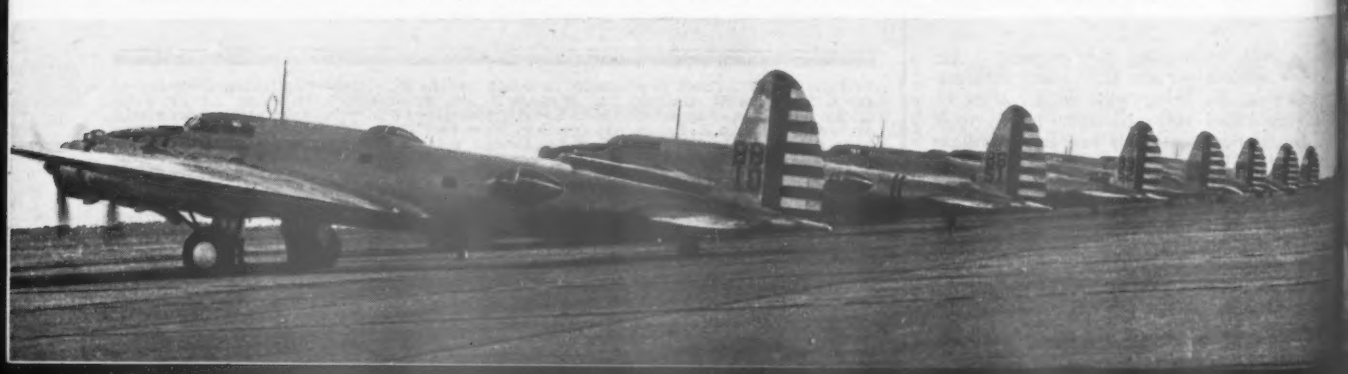
Awarded the Distinguished Flying Cross as commander of the famous flight.

Photographs courtesy U. S. Army Air Corps.

IF THE turmoil and strife of international uncertainty has not jaded your nerves too much, come on up in the control cabin of *Flying Fortress* Flagship No. 10, and dash with us down to Buenos Aires and back, leaving guns and bombs far behind—out of our minds—and with new, thrilling adventure just over the horizon, let's open the throttles. We have taken aboard a full load of Good Will to transport to our southern neighbors and have an important letter to deliver by super air mail. Hold everything! You might be interested to know how and where we learned of this contemplated trip, so let's go back briefly just eight days prior to take-off and—

It is 12:30 p. m., February 7, 1938. We are at 19,000 ft. somewhere in the vicinity of Mount Shasta, California, over solid overcast beneath which violent, unseasonable storms have been raging for some ten days. The radio crackles. In cryptic, typical form the message reads: "Return to Langley Field with the least





Even the grouchiest pessimist had to send up a rousing cheer for the remarkable achievement of the men who participated in this outstanding flight (above) and for the rugged aircraft and engines (below). Besides Lieutenant-Colonel Olds, 48 others made the flight.

TO SOUTH AMERICA

practicable delay." Our mission to Seattle thus terminates abruptly without previous warning.

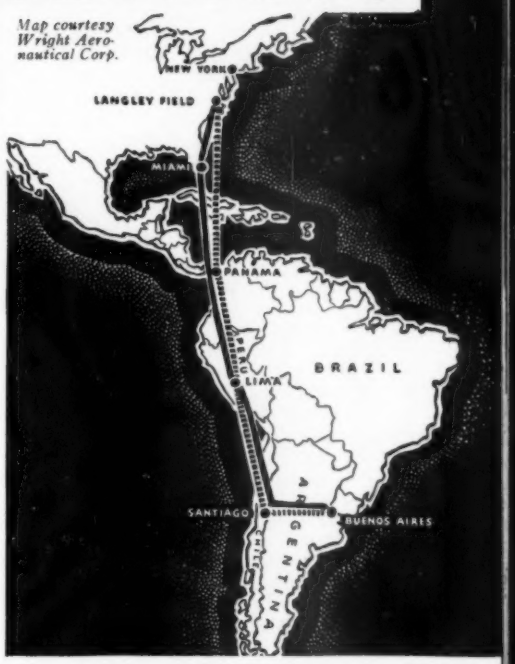
At midnight, February 8, we land at Langley Field, agog with curiosity. Within a few moments we learn that the Second Bombardment Group has been designated to accomplish a Good Will flight to Buenos Aires, Argentina, which will include visits of courtesy to the Republics of Argentina, Chile and Peru, and participation in the inauguration of President-elect Ortiz of Argentina. We are to leave the United States February 17, and if possible, arrive in Buenos Aires February 18

At long last the chance really has come to go places in a big way. To put to a convincing test the mettle of our sleek *Flying Fortress*, greyhound of military aviation. The ships we have groomed day and night during the past 12 months to meet any peace or air defense emergency arising. We are elated, and plunge into a thousand last minute preparations, including the procurement of maps, analyses of weather, spotting gasoline and oil, passports from the State Department, communications plans, etc., etc.

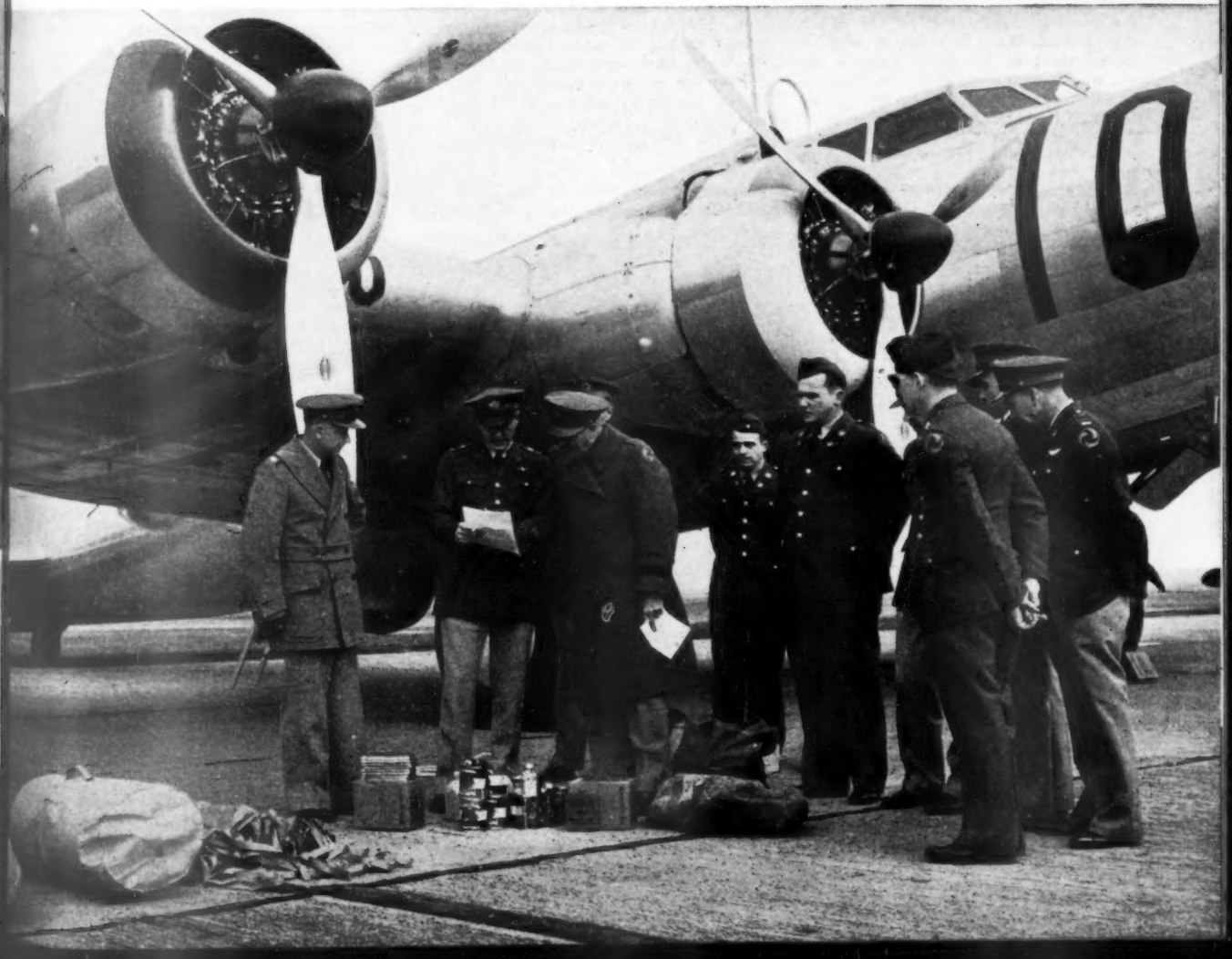
On the morning of February 15, we are fully loaded and leave at leisure for Miami, Florida, the officially designated departure point. Flagship No. 10 is piloted by myself, as group commander. Major Edwin R. McReynolds, a veteran of many thousand hours in the air, is deputy airplane commander and occupies the engineer-pilot's seat. He and I have been flying No. 10 together since it left the final assembly line in Seattle, Washington, in May, 1937. This same combination hurtled back and forth from coast to coast in record time last January on a practice cruise; practice for anything to follow.

It now looks as though that coast to coast cruise is to pay dividends. Lt. John W. Egan, the group navigator, is buried in charts, octants, dividers, com-

Map courtesy Wright Aeronautical Corp.



The author (second from left) discusses supplies for the trip with Major-General Frank M. Andrews, chief of the GHQ Air Force. The author flew the ship in the picture.



puters, and all the other paraphernalia our aerial navigators bring into play to keep us on a true course In the radio office, Capt. Robert B. Williams, the group operations officers, is checking routes, time, distances to be flown, weather, position reports, rosters, loading data, primary and alternate airdromes—and standing by to relieve either the first or engineer pilot. Lt. Edwin L. Tucker, the group communications officer, is testing the plan for radio contacts we have issued prior to departure. "Everything working O. K.," he reports with a satisfied grin. Sergeant Boutty and Private Jester, the chief mechanic and his first assistant, who have also become a living part of No. 10 since it left the factory, are beaming all over. Even with our full load we had used less than two-thirds of the runway at Langley Field on our take-off, and all four engines are now purring their deep throated eagerness to be on the way to South America. Privates Walsh and Trout, the chief and first-assistant radio operators, are "working" first Langley Field and then the advance ground station at Chapman Field near Miami. Their work is entirely in radio code—it reaches out much farther than voice and adheres more sharply to the radio frequency used. These two have a long grind of sleepless dots and dashes ahead. They should be relaxing now, but enthusiasm is too high for that.

We are gliding along at 190 m.p.h. over the Carolinas in order of take-off, spaced eight to ten miles apart in the column formation we shall use throughout our Good Will flight. Directly behind the flagship, Major "Vince" (Vincent J.) Meloy commands No. 51, then Captain "Chick" (Neil B.) Harding commanding No. 52. From position four, Major C. V. Haynes, commanding No. 80 with Lt. Curtis E. LeMay, (his navigator who is using a new type drift-meter) will relay to the flagship each our position reports in latitude and longitude to indicate the mean position of the formation. These reports, in turn, are transmitted to higher authority in Washington and Langley Field. Captain A. Y. Smith, commanding No. 82, follows Major Haynes at the interval prescribed. No 61 under command of Major "Hal" L. George brings up the rear of the column approximately 50 miles or 15 minutes behind my flagship No. 10. All planes are well within voice communication of one another but not within sight until we assemble near our objective. Each airplane must navigate "on its own."

Position reports are exchanged. No. 52 has forged ahead. "Chick" must have slipped a little higher powered gasoline into one of its tanks!

"One zero to five two—reduce manifold pressure one inch."

"Five two—O.K."

An hour later on the next position report No. 52 is back in his original position in column, due to his reduced cruising speed.

We are met at 10,000 feet over Fort Lauderdale, Florida, by Major George W. Goddard, ace photographer of the Army Air Corps who always gets results but whose photographic energy brings dismay to many others with so much else to do and so little time to do it. We are in radio voice contact with Major Goddard and try to oblige by forming first in an echelon of squadrons then an echelon of individual planes, while heading for Miami over a broken cloud background—the prayer of all aerial photographers. We nearly fell out of our seats when from somewhere out of the sky Goddard's voice announced that he was through and had gotten what he wanted even before we reached Miami. We had visions of landing at Miami via Key West to satisfy his photographic appetite. But good old Goddard must have sensed how anxious we were to land and spruce up for the big hop to Lima, Peru.

We have two air mattresses and sleeping bags in each ship. The chief mechanics and their first assistants remain aboard overnight while all others proceed to hotel in downtown Miami. Interest in the flight apparently is increasing. Reporters, news photographers, delegations. Bell boys, telephone calls, friends. That full night's rest shrinks to four hours. Up early on the 16th to inspect the fully serviced planes. Everything is in readiness. We dash to the beach to relax an hour or two in the sand and surf. It works and is restful. However, the scheduled nap later on in the hotel gives way to an assembly at 9 p. m. for the following orders:

"Alert 10:30 p. m., February 16."

"Busses leave hotel 11:00 p. m. Assemble at Flagship No. 10, 12:00 midnight."

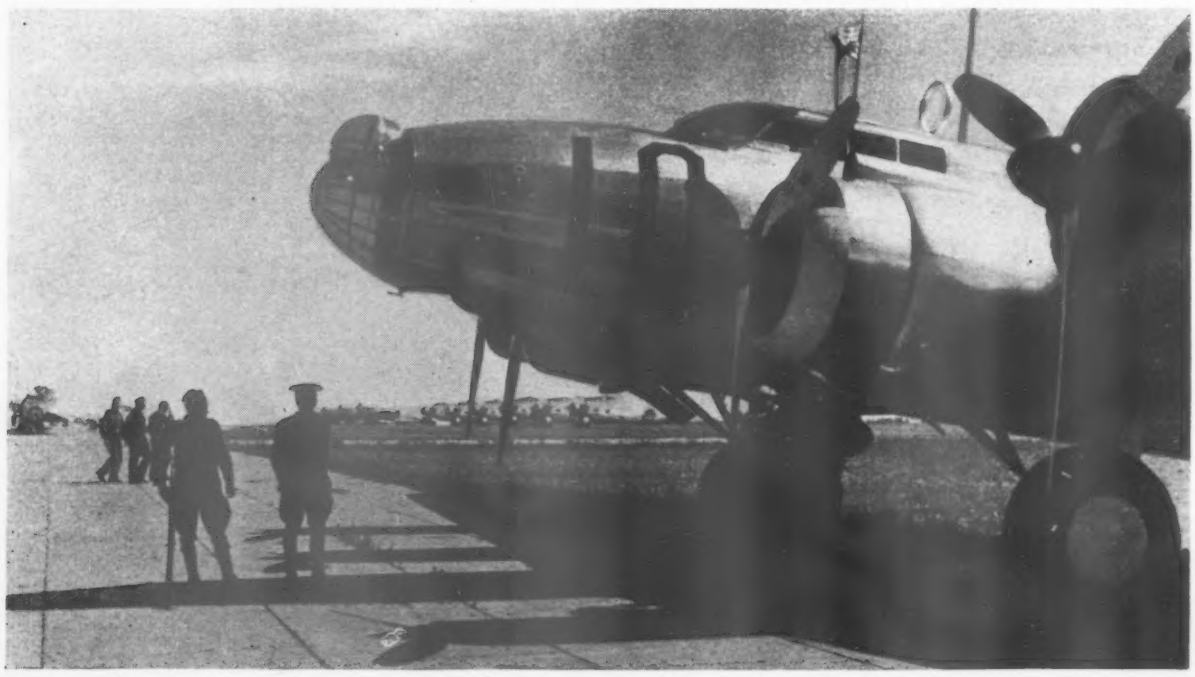
Stations—12:30 a. m., February 17.

Take-off—12:45 a. m., February 17.

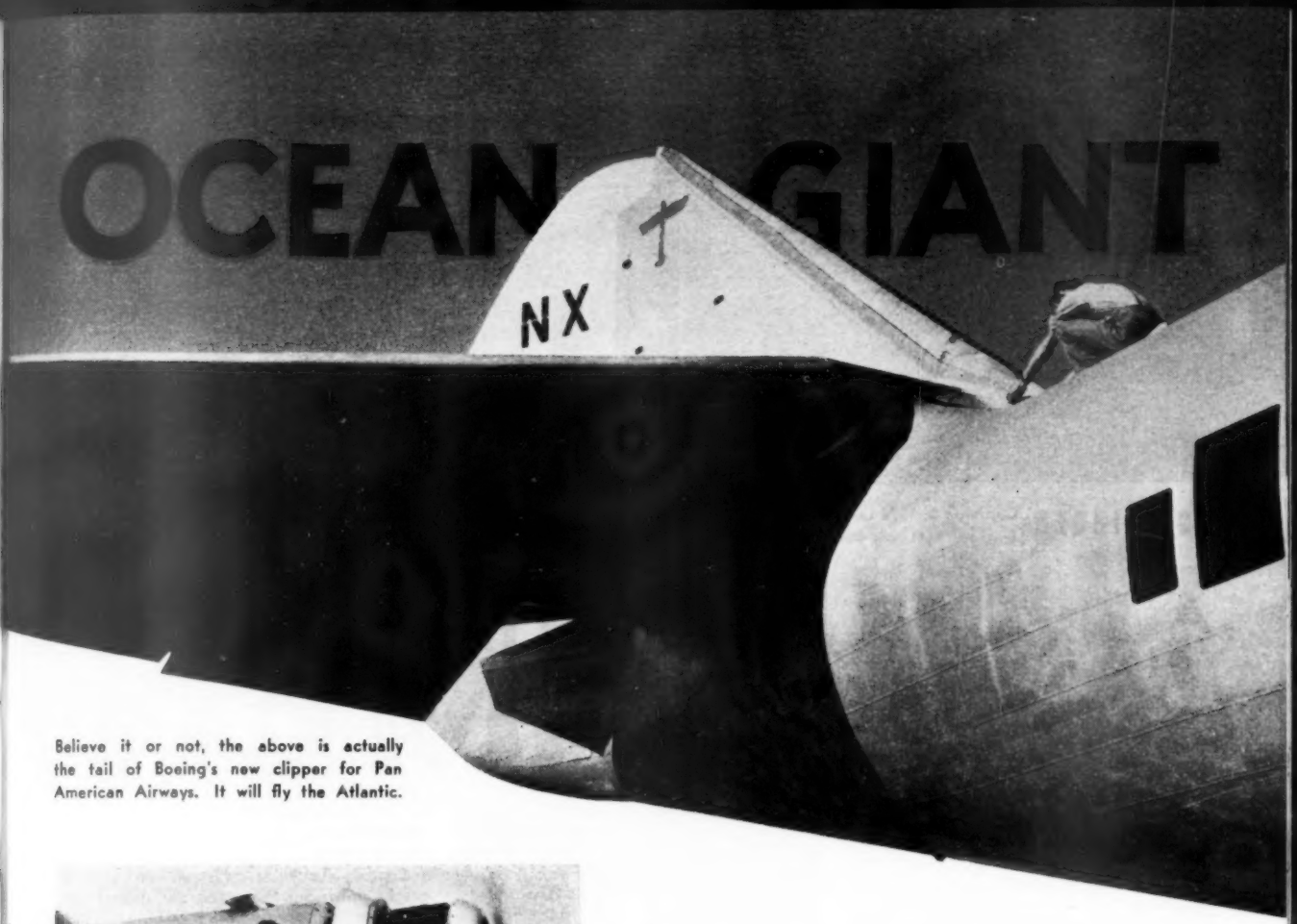
Just before midnight the Miami municipal airport springs to life in the mellow Florida moonlight. Fleecy patches of cumulus clouds drift lazily overhead casting loping shadows on the white coral runway as if ghost aircraft were practicing take-offs and landings. The

(*Continued on page* 82)

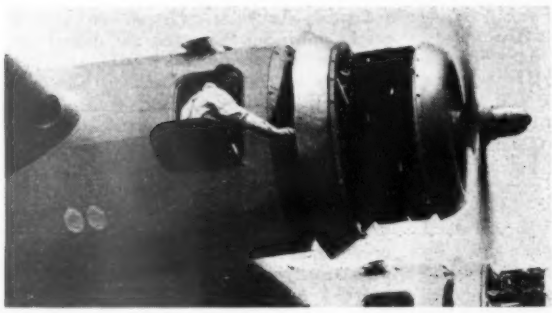
Lieutenant-Colonel Olds' flagship, Flying Fortress No. 10, frames airplanes of the Argentine air force on the airport at Buenos Aires. On each stop, the Boeings flew the hosts' and the American flags.



OCEAN GIANT



Believe it or not, the above is actually the tail of Boeing's new clipper for Pan American Airways. It will fly the Atlantic.

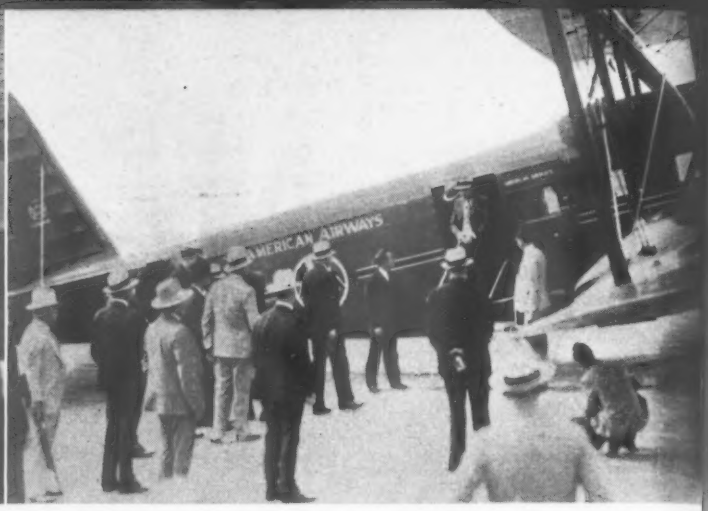


Above is one of the Clipper's 1,500 h.p. Wright engines. Both engines and the hydromatic propellers are military secrets.

IF the Boeing Clipper is breath-taking to POPULAR AVIATION'S readers, think of what that huge sky-mistress is to the men who conceived and built her. Those men have had many an awe-inspired moment while strolling through her 18 rooms; while clambering over her four engines that total 6,000 h.p. They have thrilled at what literally is a sightseeing trip through the monster's 152-foot wing. This first Boeing 314 belongs to Pan American Airways and, as the *Atlantic Clipper*, will probably carry the first revenue passengers between the United States and Europe. She will carry 50 passengers and 2½ tons of cargo across the Atlantic on 24-hour schedules. She can fly up to 5,000 miles non-stop. Her cruising speed is 150 m.p.h. The city of Seattle got a supreme thrill last month when, with its engines roaring mightily, the Atlantic Clipper flew over on its first flight. The roar of those engines, incidentally, brought a complaint from a town 38 miles from the Boeing plant. That first flight over the city was a mistake—actually. Test Pilot Eddie Allen flew her on the spur of a moment when two bolts that hold the ship to a buoy broke. The wind would have drifted the ship. So Allen flew her to safety.

She's launched! Engine run-up and taxying tests were run first. Only mishap occurred when the right wing dipped under water.

DILLINGER Captured in 1934 by G-men, Dillinger (without hat) was flown to Chicago.



KELLY "Machine-Gun" Kelly one of the kidnapers of Charles F. Urschel, is shown in the plane's door after being flown to trial.

G-MEN

AVIATION has played an important role in the work of the Federal Bureau of Investigation. Looking back over some of the more recent cases we have handled, I note that at certain strategic points in their development, the FBI has had to utilize air transportation to make our plans more effective.

The speed and the fine cooperation of aviation personnel has helped us immeasurably in so many important instances. Probably the most recent aviation "incident" with which the FBI has been linked, is the transcontinental flight we made to return John Henry Seadlund to a spot near Spooner, Wisconsin, where we found the body of Mr. Charles S. Ross, a prominent Chicagoan, who was kidnaped by Seadlund and James Atwood Gray. Seadlund had later killed Gray, whose body had been hidden with that of Ross.

Of necessity a meticulous cloak of secrecy must be connected with the various flights we have had to make on important cases, since criminals like Seadlund are constantly on the alert in reading about the investigative activities of Special Agents of the FBI. If he had known what we were doing toward apprehending him, he could easily have avoided capture. By sticking to the only logical course, then, we were able to capture him, return him—by air to the scene of his crime, and close the entire case within a few days. As is the custom of the Federal Bureau of Investigation, when time is of the essence, an airliner was chartered, the prisoner and several Special Agents were loaded aboard, and from that time on, that airplane disappeared from in front of the public eye. After all, we did not know but what Seadlund had desperate accomplices that might have tried to repeat the horrible slaughter of June, 1933, in which gangsters machine-gunned to death three police officers, and a Special Agent of the FBI, in an effort to free a bank robber.

In extreme emergencies we use chartered airliners. The airlines always have —and for it I am deeply grateful— extended the utmost in cooperation to our men. Airline officials, pilots, dispatchers and radio men have covered the movements of their airplanes that we charter with the greatest efficiency.

When aviation must help us in solving a case, the men of the FBI seek the closest available airplane. It is understood that the pilots and other persons connected with the flight say nothing to anyone concerning our movements. Refueling stops attract little or no attention, largely because no one realizes the mission that airplane is on. When pilots purchase maps of the area we must fly to, they say nothing about their reason for doing so. Lest our movements be checked by short wave radio, airline radio men make no mention of us, and refer to our chartered airliner merely as "Flight So-and-so."

The aviation industry has contributed to the personnel of the FBI, since there are 23 of our men who were formerly actively engaged in the aviation industry. One was once a parachute jumper. Several of these hold pilot's certificates today. Not only do we have pilots in the FBI, there are Special Agents on whom I can depend for aeronautical engineering work. It was an FBI man, working in the Zeppelin plant at Akron, who broke the sabotage case in connection with the *U.S.S. Akron.*

The extensive laboratories of the FBI in Washington sometimes perform examinations that are not always in connection with crime detection. The FBI laboratory, for instance, has handled special identification work that has come up in connection with puzzling airplane accidents. FBI laboratory men helped determine the cause of one airline crash by deciphering the contents of the dead pilot's log book which had been soaked in oil. Infra-red rays brought out the pilot's notations in the book.

Getting back to aviation, though, I might point out that even our use of the airplane is not always infallible. That again is an important reason why we must cloak all our flights with great secrecy. And once a suspect knows what we plan to do, there is no reason why he can't make use of aircraft himself. Alvin Karpis did, for instance.

Though aviation has been a boon to us in many ways, there is no way we can prevent criminals from taking advantage of flying. The airlines could no more keep track of their passengers' occupations than could the railroads. Hence, while we have access to the most modern transportation facilities, so has the criminal. The modern criminal can conduct his operations on the Atlantic and Pacific coasts—*all within a few days.* He uses every facility in his efforts to avoid the law. Consequently, he will use the airplane in much the same manner as we do.

In the following I will attempt to show how we used aircraft to help in "cleaning up" the Barker-Karpis gang. It was on January 17, 1934, that Mr. George Bremer was kidnaped at St. Paul, Minn. Following negotiations that resulted in his release after payment of $200,000 ransom, the FBI quietly launched a nation-wide hunt for the kidnap gang. During the work that followed (for more than 2½ years) we used airplanes extensively. Rapid transportation to various parts of the country was often essential. Through the course of our investigation it developed that the kidnaping had been perpetrated by members of the Barker-Karpis gang. We finally caught "Doc" Barker in Chicago

SEADLUND The author and his agents brought John Henry Seadlund to Chicago in this chartered TWA airliner.

IRWIN G-men tracked down Robert Irwin (in doorway), got a confession, flew him to trial.

in the AIR

BY J. EDGAR HOOVER

The world's most famous crime-breaker wrote this article exclusively for us. The airplane is an important FBI tool.

on January 8, 1935. He was one of the leaders in the gang, and chief participant in the crime. Because of his known criminal associations and the necessity of moving him from Chicago to St. Paul for trial, "Doc" Barker was transported to the latter city by airplane. Clues found in Barker's Chicago apartment, meanwhile, pointed to other members of the gang in Florida. In reading letters from the gang to Barker, we found that they were living near a lake where "Old Joe," an alligator that had apparently become a tradition because of his ability to avoid hunters, was known to hold forth. Our special kidnap squad, operating out of Chicago, boarded a plane for Florida.

After a bit of inquiry in the vicinity of Ocala, Florida (the letters bore this postmark) it was found that "Old Joe" lived in Lake Weir. Persons answering the description of Ma Barker and Fred Barker were found to be living in a house facing that lake.

FBI Agents surrounded the house. An order was called to the occupants to surrender. The answer was a hail of machine-gun bullets. The Barkers' fire was returned, bullet for bullet. Firing continued for about an hour. Soon more ammunition was needed, as were more FBI men. A hurried call and airplanes were flying reserves in from Charlotte, North Carolina, Birmingham, Alabama, and Jacksonville, Florida. When the firing finally ceased, Kate and Fred Barker were found dead.

That did not end the Bremer kidnap case, however. The investigation continued and it was not long before we captured Volney Davis, another member of the kidnap gang, in Chicago. He too was flown from Chicago to St. Paul for trial. Then we set out after two more of the gang—Myrtle Eaton and William Weaver—who were believed to have headed for Florida. Our agents knew they were rapidly moving from place to place. Finally a "hot clue" was received and airplanes again were needed. The special kidnap squad flew to Jacksonville. On the morning of September 1, 1935, the couple were located and captured. They too were flown to St. Paul for trial.

Though we had captured several important members of the gang, the FBI had done no more than break the strength of the kidnap band. Alvin Karpis was still at large. He had escaped a trap set for him by the police of Atlantic City, New Jersey. He was traced to Ohio where he was identified as having taken part in certain bank and train robberies. Karpis, with John Brock and Fred Hunter, held up a train at Garrettsville, Ohio, on November 7, 1935, and escaped with $34,000 in cash and several thousand dollars worth of securities. The trio made elaborate plans for a getaway. Fast automobiles were too slow for Karpis. Early on the morning of November 8, 1935, the three bandits boarded an airplane at Port Clinton, Ohio. They had chartered the ship and its pilot, who flew them to Hot Springs, Arkansas. Soon, however, we received word that Karpis was in New Orleans. It was there, on May 1, 1936, that we arrested him and Fred Hunter. Karpis was subsequently flown to St. Paul.

Seven days after Karpis' capture, the airplane again came to our assistance in this same widespread case. Harry Campbell, another member of the gang, had been caught by FBI Agents at Toledo, Ohio. He was speedily flown to St. Paul, tried and sentenced.

It can readily be seen from this case, that the airplane plays an important role in FBI work throughout the nation. In this modern age justice must move swiftly. Speed is all important. For instance, FBI Agents trailed Thomas H. Robinson, Jr., across the nation to Glendale, California, where he was subsequently arrested for the kidnaping of Mrs. Alice Speed Stoll. By using aircraft

This quaint little Southern home which housed Ma Barker, was later shot up by the "G" men in their famous raid.

again, Robinson was returned from Los Angeles to Louisville, Kentucky, tried, sentenced to life imprisonment in the Atlanta, Georgia Federal prison, and delivered to that prison—*all within 60 hours.*

An unusual case in which airplanes were involved was that in connection with the kidnaping of Charles F. Urschel of Oklahoma City in July, 1933. Indirectly, it was the airplane that ultimately led us to the solution of this case. Mr. Urschel was taken to a rural community by his kidnapers and held captive. An acute-minded person, he noticed that every day at a certain hour he heard an airplane fly over the house in which he was being held. Shortly after the airplane passed over, he made it a point to ask his guard what time it was. One day the airplane failed to fly over. Mr. Urschel made particular note of that.

Following his release after the payment of $200,000 to his captors, Mr. Urschel carefully related the events that took place while he was held prisoner. He told about the airplane flying overhead each day. He told of the day the regular plane did not fly over. Working on that single clue, we checked airline weather reports throughout the southwestern states. Soon it was found that an airplane flying its regular route was forced from its Fort Worth-Amarillo (Texas) course by weather conditions. On a map, this alternate course showed the airplane had avoided the territory in which Paradise, Texas, is located.

An investigation was started immediately in the vicinity of that town. Sure enough, our search resulted in the location of the kidnapers' hideout on the farm of Cassey Earl Coleman, a relative of Kathryn Kelly (wife of "Machine-Gun" Kelly). The kidnapers, though, had left. They were trailed through St. Paul, Chicago, to Memphis, Tennessee, where, on the morning of September 26, 1933, local police and FBI Agents closed in on them. The couple was immediately placed aboard an airplane and rushed to Oklahoma City were they were tried and sentenced to life imprisonment.

I have attempted to show the important part the airplane plays in the work of the Federal Bureau of Investigation. It can be seen where, in the few cases mentioned in this article, the absence of aircraft might quite logically have written an entirely different ending to our law enforcement efforts. The past cen-

(*Concluded on page* 90)

This map shows the air routes radiating from Oklahoma City, as used by the "G" men in running down the Urschel kidnaping case.

Bombers Lick Volcano

DID you ever hear of bombers saving human lives by showering the earth with high explosive? It's true—and Americans are the ones who can do it.

The scene is the surrounding valleys around Hawaii's famed volcano, Mauna Loa. Back in 1935, Mauna Loa erupted and began to pour huge streams of lava down its sides toward the towns and villages around its base. The only way the homes and habitants could be saved from the deadly lava was devised by a scientist experienced in volcanic lore. When he saw the deadly streams creeping toward the homes, he knew that the only salvation lay in the diverting of that stream. Hurriedly he telephoned the U. S. Naval air base at Pearl Harbor.

Would Navy airmen be so good as to take off immediately and bombard the lava stream with high explosive air bombs so as to change the stream's direction? Permission first had to be obtained from President Roosevelt. A quick cablegram got that permission. The bombers took off and shortly after a series of shattering blasts told quaking Hawaiians their homes had been saved. The bombs did an admirable job.

Today Navy airmen have been given a free hand to repeat the performance, just in case. Mauna Loa has yet to repeat her performance.

Find Plane After 10 Years

TEN years ago a South African pilot crashed while flying from Elisabethville (in Africa) to Brussels, Belgium. His mishap took place in the Belgian Congo, that section of Africa famed only for the killers of the animal world that big-game hunters seek.

The crash dislocated the pilot's thigh, leaving him in that wilderness in almost helpless condition. However, he managed to *crawl* 16 miles before reaching a native settlement.

Meanwhile, the authorities sought the remains of his airplane. Searching parties failed to find it. A reward of about $250 was offered to anyone finding the ship. It was to no avail.

That was 10 years ago. Just recently the remains of the airplane was found. The pilot, now an instructor in Capetown, South Africa, expressed his pleasure.

Try New Diesel Engine

DIESEL engine inventors have taken new heart recently after a vacation of several years. At least two new Diesel engines are under development and perhaps more.

One of the new Diesels is a radical departure from former models as a binary combination is added to the pure Diesel cycle. Jacket heat is employed for generating pressure in a secondary cylinder so that approximately 25 percent is added to the normal Diesel output. The added cylinder also functions as a primary air-compressor on the return strokes.

Windmill Mail

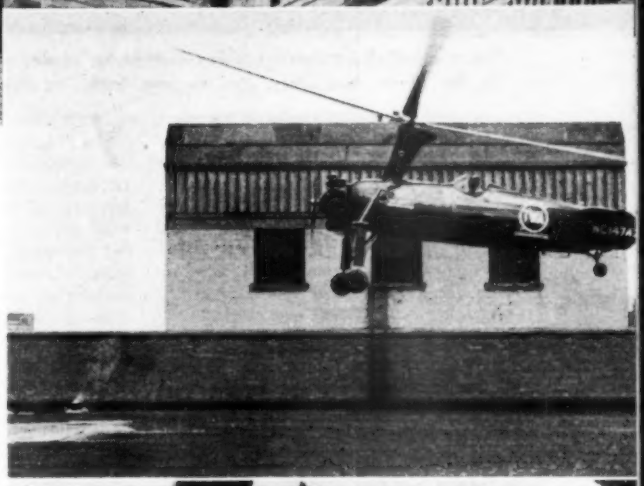
The steel plates on which Johnny Miller landed can easily be seen in the center of the post office roof. The take-off was from right to left.

NATIONAL Air Mail Week (May 15 to 21) brought on all sorts of aeronautical stunts. There were stunt flights, commemorative flights and a thousand and one inspired eulogies to that great American institution, the air mail. Hundreds of lightplanes flew mail to all corners of the nation one day during the busy week.

And Pilot Johnny Miller picked up a load of mail from the roof of the Chicago post office with an autogiro.

The stunt pictured on this page was one of the most practical ideas produced for Air Mail Week honors. It had been done before (in Philadelphia) but the ease with which Miller settled to the roof, picked up his sacks of mail and took off again gave progressive-minded aviation folk something to think about. Miller is a veteran 'giro pilot who gained some prominence in that field of flying some time ago by looping one. He now is test pilot for the Kellett company at Philadelphia.

Miller's beautiful work in hitting the steel plates on the Chicago post office's roof proved that, were the entire roof available, it would be simple to ferry mail right into the heart of the citty. The steel plates were necessary because of the soft tar roof. But there was more than enough room as the photographs show and, though it was little more than an Air Mail Week stunt, Miller did lop off a good half hour's time between Chicago's airport and the downtown post office.



The center photograph shows the 'giro a moment before landing. Note smoke pot.

Postmaster Ernest Kreutgen of Chicago congratulates Miller on the landing.

The take-off (left) was easy. Miller got the Kellett out with room to spare.

The BEST or t

The Martin B-10 bomber has proved itself to be "quality plus" after years of constant service in the Army Air Corps. Are we wise in buying quality? Or should we seek quantity?

by Lieut.-Col.
Bryce R. S. Heatherington

Here is a problem every world power faces today. Probably nothing short of a major war will solve it.

YOU are the Commander, let us say, of an air force about to come to grips with an enemy in the grim circumstance of the War To Come. The air force of an Old World power, whose vital areas are within easy flying range of the enemy's air force. Hostilities haven't started yet, but the armies are mobilizing and everything is set for the first serious move. Your country has a pretty good air force, but can only use half of it at the beginning. Part of it must be kept behind, in colonial possessions, or to safeguard other parts vital to the nation; perhaps the routes or "nation's life lines" to the colonies.

The General of the Armies calls up from GHQ. Says he, "We'll give you your choice. What will you have: those 17 squadrons of late-type planes we got just before this war started, or 24 squadrons of those four-and-five-year-olds? Make your estimate of the situation, and give me your reply in 24 hours."

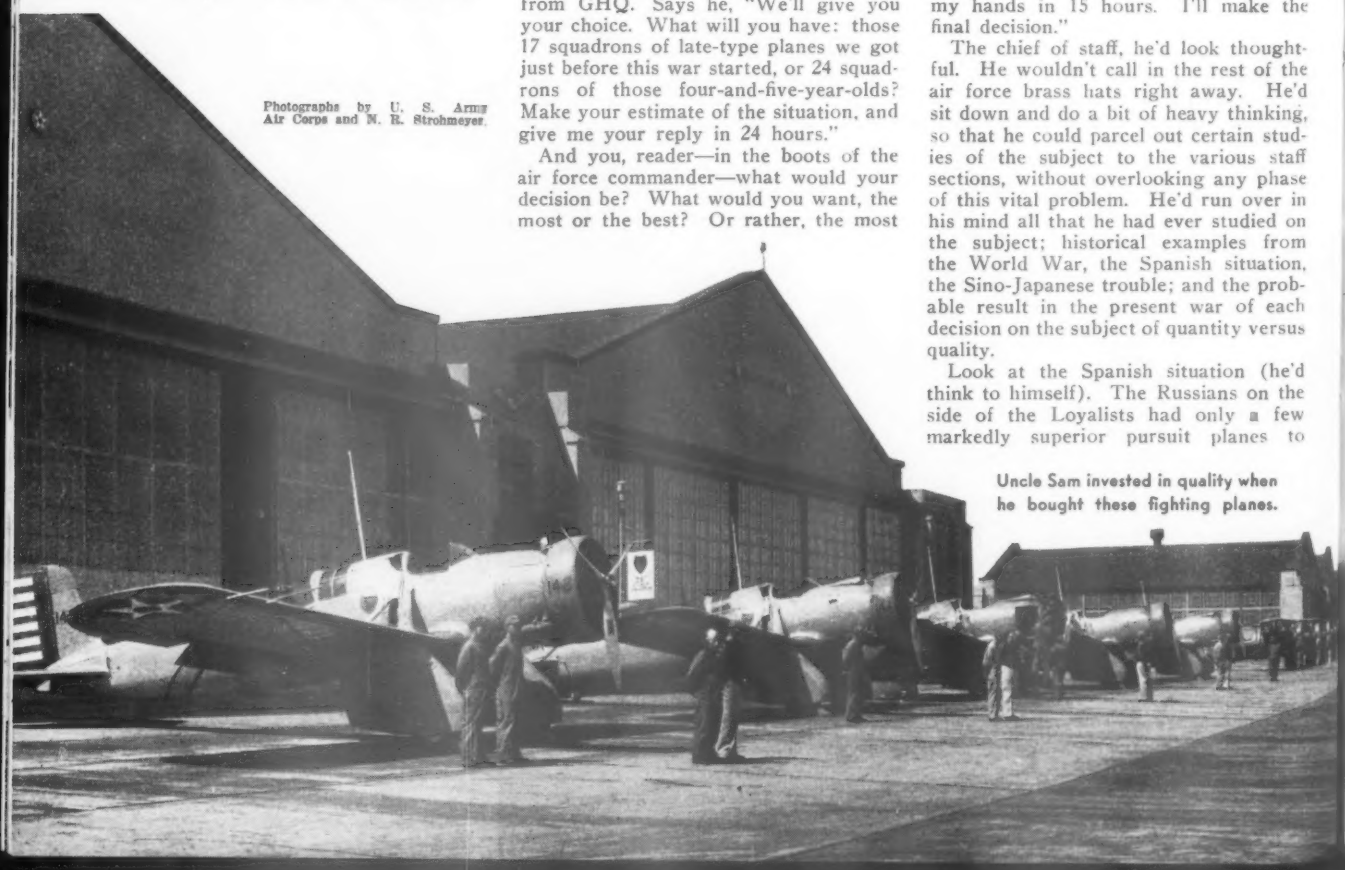
And you, reader—in the boots of the air force commander—what would your decision be? What would you want, the most or the best? Or rather, the most or the newest? Quantity versus quality? The pretty-goods or the perfects? A few top-notchers or a lot of fairly serviceable crates?

You are air force commander now, and you can't delegate the decision to anyone else. That's why you get more pay than the common herd, not for working harder but for your added responsibility; because you are the one who must make the final decisions. Do you know what the air force commander would do in this case? He'd call on his chief of staff and say, "Chief (or Joe, or Colonel, or Smith) you heard what the General of the Armies just said. Make up an estimate of the situation. Have it in my hands in 15 hours. I'll make the final decision."

The chief of staff, he'd look thoughtful. He wouldn't call in the rest of the air force brass hats right away. He'd sit down and do a bit of heavy thinking, so that he could parcel out certain studies of the subject to the various staff sections, without overlooking any phase of this vital problem. He'd run over in his mind all that he had ever studied on the subject; historical examples from the World War, the Spanish situation, the Sino-Japanese trouble; and the probable result in the present war of each decision on the subject of quantity versus quality.

Look at the Spanish situation (he'd think to himself). The Russians on the side of the Loyalists had only a few markedly superior pursuit planes to

Photographs by U. S. Army Air Corps and N. R. Strohmeyer.



Uncle Sam invested in quality when he bought these fighting planes.

the MOST?

Fighters like this Boeing P-26 can't be second-rate and last. American military aircraft are noted for their long useful life. The P-26, though years old, is still in use.

tackle the bombers and observation aircraft of the rebels. What happened there? Whenever the Russian pursuiters took the air they had air superiority on a wide front. Not a rebel bomber or observation plane dared take the air. Their losses were too great. It was something that impressed even the hard boiled press correspondents. But the Russians didn't have enough pursuit planes to keep in the air during all the hours of daylight. So when they had landed, when reports came back to the rebel airdromes that no Russians were seen in the air, the rebel planes took off. Opposing them were some obsolete old crates of the Loyalists, easily evaded, easily outmaneuvered and fought off. In other words, the Loyalists had the upper hand while it lasted, but it didn't last long.

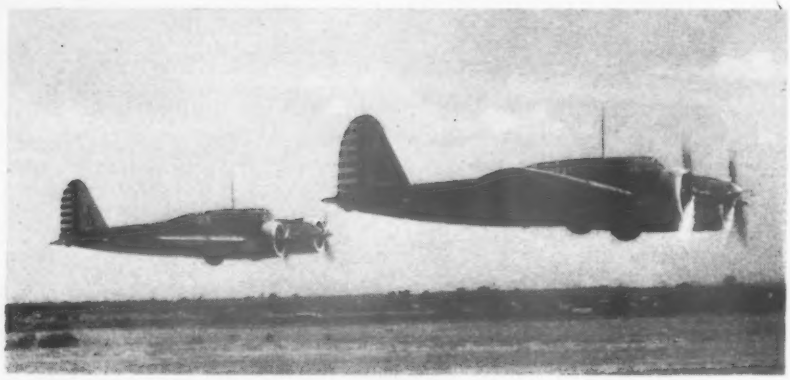
"While it lasted." That was an important item. Superior aircraft would outlast obsolescent ones in aerial warfare when engagements took place in the air. But where, in this War To Come, would most of the losses be sustained? In the air or on the ground? In Spain it appeared to be in the air, but everyone knew that was because of the poor air strategy of the opposing leaders, the poor air staff work and planning, the lack of central authority. Instead of smacking the enemy's planes on the ground where they were most vulnerable, they took the spectacular path, and battled in the air. In the War To Come, it was a case of two great powers against one another, the enemy air force commander was no fool. He'd seek out airdromes and hit them and the planes on them often and hard, with bombs, machine guns, gas, and probably corrosive liquids. So 24 squadrons of obsolescent planes would have more survivors from a general airdrome straffing than would 17 squadrons of the latest types. Until it got down to where we might have eight squadrons of obsolescent planes left as against one squadron of late and perfect ones.

In the World War, in the Spanish trouble, among the Chinese in the Oriental strife, probably in this War To Come, many casualities would be experienced from forced landings due to motor trouble, taking off from inadequate airdromes, or night operations. What type of plane would suffer the most, what type the least? Engines are improving, aren't they? So the late type planes with modern engines might not have so many forced landings due to engine failure. Well, yes and no. Modern engine designs are great, but these particular ones in the late type planes haven't had all the bugs ironed out of them. Except for those engines in the older planes that have been overhauled five or six times and are prone to metal fatigue, the engines in the older planes have been fool-proofed. They've had many changes on them since the day they left the factory; all these changes making them less liable to mechanical defect; more able to stand punishment.

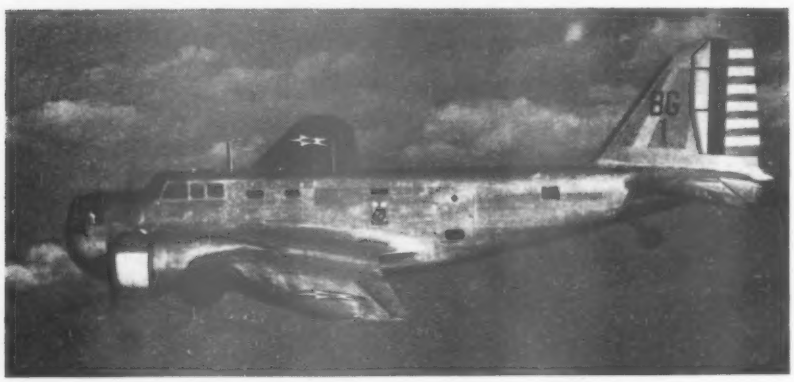
How about operating in and out of poor airdromes and under all sorts of weather conditions? Where would the casualties show up? There was a draw. The larger, more modern bombers might not do so well. Give them a good airdrome to operate from and they'd deliver more bombs on a target than the other smaller, older bombers. But good airdromes were scarce, and too easily detected by the enemy, and they might have to operate from the poor ones from which they couldn't always drag two tons of bombs while the smaller bombers were pulling off with their one-ton loads in rainy as well as in dry weather.

And then when the bombers get in the air. Ah, there's where the new ones would show up well. Faster, better able to evade enemy pursuit planes and to go above anti-aircraft artillery fire, or to dash through such fields of fire in a shorter time than the slower crates. There's where the new bombers scored high. But suppose night operations were

One of Uncle Sam's choices for attack-plane quality is the Northrop A-17A.



The twin-engined Curtiss A-18 above is the Army's latest attack type. Squadrons that have been using single-engined equipment like the A-8 below now are getting A-18s.



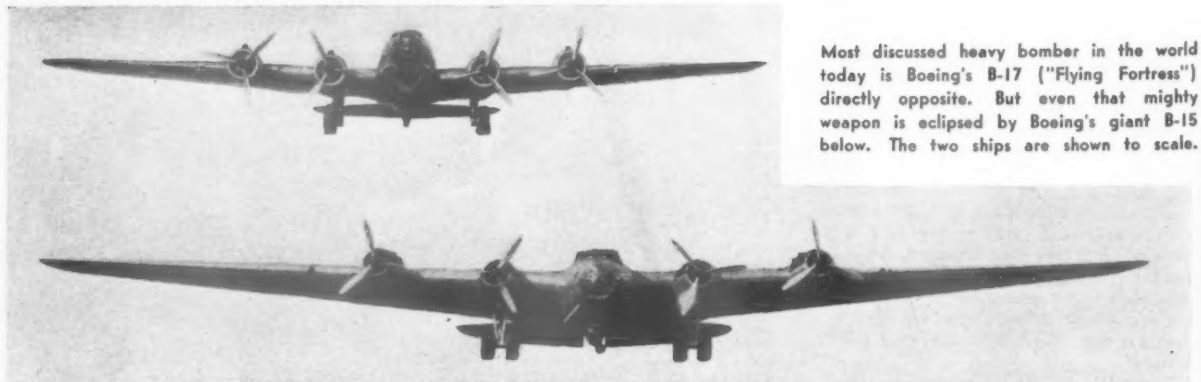
The Douglas B-18 bomber above is the military version of the famed DC-3 airliner. Douglas also is secretly at work on a 160,000 pound four-engined bomber for the Army.

carried out where enemy pursuiters would be ineffective? Or against objectives undefended by anti-aircraft artillery. There would never be enough anti-aircraft artillery on either side to defend all the vital areas against bombardment attack. So why not a larger number of slower bombers?

What would happen when returning to the airdromes, at night, or under conditions of poor visibility due to weather? The newer ships had all the radio aids to navigation which some of the older ones lacked. But another important item in this situation was the ground installation; the blind landing apparatus. That would work as well for an old plane as for a new one, where both planes had the same radio installation.

H-m-mmmm, here was something for G-1, the assistant chief of staff for personnel. Did they have enough pilots trained in blind landing work to man all the many older planes or just enough to handle the fewer number modern crates? Mustn't neglect the personnel side of this question. These new planes took the best pilots obtainable, but some of the old crates weren't worth a darn without experienced men at the stick. How many first rate pilots and combat crews were available for immediate work over the lines? Also, how many experienced air officers would be left available for staff duty and other ground drudgery after the pilot and combat crew requirements were satisfied? Staff officers were highly necessary in an air force. No combat squadron or group could jump off in these highly competitive days and expect to survive or complete their mission unless their mission and flight had been well planned. So personnel would be a big factor in the question of airplane quality versus quantity. The man and the machine would have to be balanced.

"Balanced." What else would have to be balanced? Oh, yes, "a well balanced air force,"—that was a phrase his instructors had used years before when he was a student at the Air Force College. Were these 17 newly-equipped squadrons well balanced? That is, did they have the correct proportion of pursuit, attack, reconnaissance and bombardment aircraft? Were the performances of these new planes balanced so that the attack planes could accompany and the recon-



Most discussed heavy bomber in the world today is Boeing's B-17 ("Flying Fortress") directly opposite. But even that mighty weapon is eclipsed by Boeing's giant B-15 below. The two ships are shown to scale.

naissance planes precede the bombers? Yes, they were. For the first time in the history of his air force the respective performances of the various types were well matched. As to quantity of each type; the field army commanders over whose fronts the air force would operate would probably complain of the scarcity of pursuit planes to safeguard the operations of their army observation planes, but that would be the ground commanders' worry.

How about extra equipment? Chemical tanks on the attack planes, for instance. Suppose the enemy started chemical warfare on a large scale, and we were forced to retaliate. How soon could tanks be built and supplied to the new planes? Also chemicals; how soon could they be delivered to the airdromes? That would be a problem for G-4, the supply man, to investigate. While a few of the old attack planes had chemical tanks the old bombers didn't have the new air cannon, recently installed on the new bomb carriers. And the chances are they would have to use a long range weapon in the bombers because the enemy pursuit planes were going to use small time-fused bombs to drop into the midst of bombardment formations from a height beyond the effective range of the bombers' 30 and 50 calibre machine guns. The only thing that would reach them would be the new air cannon. Much bigger and longer range than the small "cannon" being used by some of the enemy pursuiters.

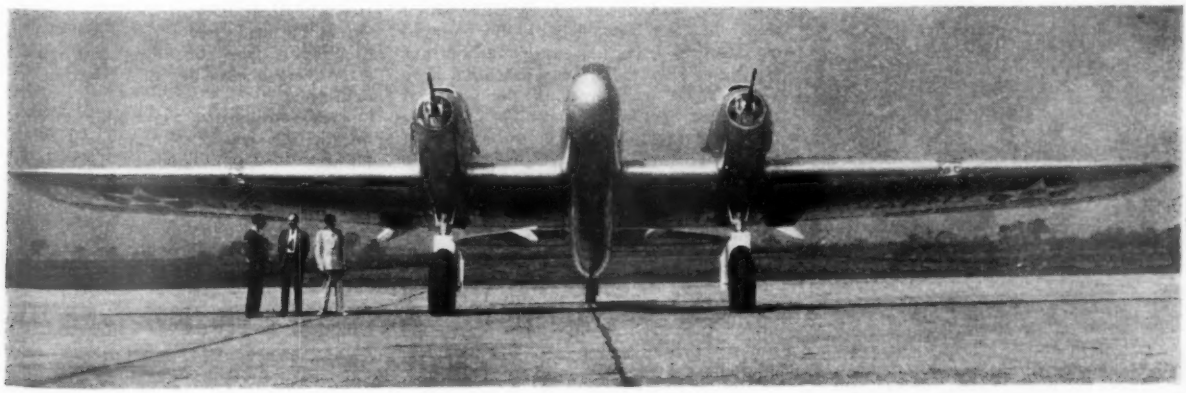
Yes, sir. They'd be up against a strong enemy air force. None of your one-sided air situations like the Italians had in Ethiopia. Or the uncoordinated and heterogeneous air force used by both sides in the Spanish troubles of 1937-1938.

What was that other phrase he had read in that American's book on modern warfare, written back in '37? "Initial errors in the employment of an air force will be far more serious than in the case of the ground forces." Perhaps it *would* be better to have a small but highly efficient air force, to deal several smashing, effective blows right at the beginning, rather than a not so efficient air force but one more durable, that could keep plugging away until replacements were supplied from the factories. And

(*Continued on page* 91)

Some Army pilots today say the Boeing P-12 series (above) contained some of the best-flying airplanes in the Army. Latest pursuits are the Curtiss P-36 and P-37 below.

Still seeking quality, the Army Air Corps is testing the potent P-37 (above) and recently ordered several Bell "Airacudas" (below) for field operations experiments.



Flivver

The "refueler" is tied to the car's hood. He must catch the rope, attach the hook to the can and pull away quickly—all at 50 m.p.h.

by KURT RAND

Photographs from DeWitt Carroll

Because they flew Eastern Air Lines' route to Miami and back, Kress and Englert sought advice from veteran EAL pilots. Kress is on the left, Englert in center.

SO THE light airplane is just an airport toy? The modern day flivver can't go anywhere? So it's really just a putt-putt for local hops?

This sort of stuff got under a lot of people's skin and something had to be done about it. It was—dramatically by Kenny Kress and Glenn Englert, two Lock Haven, Pa.. pilots who really put on a show that astounded the whole seaboard from New York to Miami. All along Eastern Air Lines' route between those two points complete aeronautical attention was on the little *Cub* which took off from Newark with the blessing of Eastern Air Lines and the weather bureau at 4:06 on Tuesday morning, May 17th. What was ahead of the pilots at that time seemed slight. The weather men said there'd be three good days of flyable weather all the way to Miami and back, the route of the trip which was to take the *Cub*-class airplane out of the airport category.

Everything from soup to nuts was on board NX-20280 as it lifted from the "meadows" of Newark. Nine gallons of gas up front, 24 in a special belly tank under the fuselage and, just for good measure, five gallons in the baggage compartment as a "night cap" in case the Lenape *Papoose* engine needed another little drink before it got to Raleigh, the first refueling point, 444 miles away. The ship itself was a stock model *Cub* powered with the 50 h.p. *Papoose* engine, a reincarnation of the former three-cylinder Aeromarine which appeared on *Cubs* four years ago. The engine has been revised since those days, and every trace of vibration which was characteristic of its predecessor has been removed by a newly designed balanced crank shaft and floating motor mount attachment. In tests to decide which type of engine would be used before the flight started, this factor was considered but ignored after every one agreed that vibration was negligible.

Preparations for the flight started a month before, and every precaution was made to insure its success. Airports had to be contacted, permission from each manager received, waivers from the Bureau of Air Commerce arranged for and, most important of all, adequate preparations beforehand for refueling the ship in mid-air at the designated points along the route. Original plans called for a take-off on Friday the 13th from Newark, with an afternoon arrival back at Newark on Sunday—about 40

Flight

Newark to Miami and back in a lightplane! And non-stop at that! Which, of course, makes a bang-up story you'll enjoy.

This picture was shot a few seconds after that on the opposite page. Both the ship and car had to make contact at comparatively high speeds. Note photographer on car.

hours in all. When weather indications looked unfavorable the trip was put off until Tuesday. The pilots of the trip were Kenny Kress, POPULAR AVIATION'S "One Man Air Force" (POPULAR AVIATION, April, 1938) and Glenn Englert, Kenny's assistant ringer-outer at the *Cub* factory, better known as "Boog."

Naturally, they were nervous on the take-off. Kenny, feeling the responsibility even more than Boog, looked like a deacon ready to open up Sunday morning's church. Their worries were probably no more than those of a football player before the opening play in a game—in fact, one of the biggest decisions they made was whether they would smoke on the trip or not. The outcome of it was that your correspondent received a present of three good packs of cigarettes from the boys just before they took off, as they decided that nothing should be done in the way of lighting matches with all that gasoline on board.

Very little special equipment was carried on board. Naturally, the ship had one-way radio which Bill Lear kindly lent for the trip. With a 200-hour battery, there was little to worry about the equipment failing on the trip. Instruments other than standard were a Kollsman sensitive altimeter which eventually proved to be a life saver, a compass and that was about all. For food they took some chocolate bars and nothing else, preferring to pick up sandwiches, etc., at each refueling point.

All in all, the ship weighed 1,324 pounds on the take-off, which is 324 pounds more than a *Cub's* normal gross load. Time of the take-off was 17 seconds which, under the circumstances, was excellent. As one observer said, "None of those 50 horses are in the barn when that *Papoose* takes hold." Normal cruising speed with the tank dragging underneath, etc., was estimated at 74 m.p.h., so the average speed of a little more than 40 m.p.h. indicates that the boys had a bit of wind on their nose on the way to Raleigh. Fourteen contacts were made there under the excellent manipulation of Bill Mann, an employee of the Piper Aircraft Corporation, who went to North Carolina to give the ship its drink. Wind conditions near the ground were rotten but despite the bumpiness 30 gallons were hauled up and tucked away. Biggest excitement was when Bill Mann fell off the running board of his car while trying to make contact, bounced a couple of times, but kept on refueling as the ship circled around. Incidentally, if you're not acquainted with the refueling method, it consists of hauling up gasoline in five-gallon cans by rope. The refueling crew is on a fast-moving automobile, and as the car gets under the airplane, the hook is fastened to the can. In bumpy air it's a lot of fun. Air speed on the contacts were around 50 m.p.h.

At 1:00 p. m. Tuesday the boys finished up their gassing at Raleigh and stuck the nose into an increasing southwest wind for Jacksonville 397 miles away. The weather was decent along the Georgia coast but, of course, darkness hit

Action plus in this refueling shot at Miami airport. The can of gas is just leaving the car on the plane's hook. The car driver had to be just as able as the pilots.

them long before they arrived at Jacksonville. Gas started running low and with nothing left in the belly tank, the wire gas gauge up forward in the main tank hit the bottom three beacons out of Jacksonville. Kress estimated they had ten minutes fuel left as they reached the airport. But then came a crisis. An Eastern Air Lines ship was due to land in five minutes, and by the time that was over and gas passed up to the *Cub*, it probably would have been too late. Eastern Air Lines courteously made a wide circle around the field while five gallons were sent up. Then the boys waited for the Douglas to get in and out. Twenty minutes after midnight they said goodbye to Jacksonville and headed down the coast to Miami. And here is where the real drama of the story begins. Shortly out of Jacksonville they ran into fog, mixed with smoke from an inland forest fire, and rain. Visibility was practically nil, and after three hours of milling around they found themselves in the interior of Florida over the swamps. They were actually flying blind with the sensitive altimeter doing yeoman service as a rate of climb indicator and the compass serving as turn indicator. Lights to the south indicated a city and at 3:15 they came out over Orlando. Any normal person would have thrown in the towel right then and landed at Orlando, but the desire to go on made the boys think of other things. Their gas was too low to continue on to Miami, so they headed back to Jacksonville and picked up another load at dawn, clearing there again for Miami at 8:00 a. m. The trip down the coast was easier as the weather cleared. Refueling at Miami was a matter of great local interest. It was at 2:00 p. m. they made that final 180 degree turn and headed north again. As if it wasn't enough to make the 1,200-odd miles down without having to go up hill again to Newark. But they were determined. Kress reported at Miami they were feeling "pretty good," although they were probably pretty tired.

Weather north of Jacksonville was terrible and no prediction of its letting up seemed to indicate that the pilots would have to land or wait. After picking up several cans at Jacksonville at about 10 p. m., the boys ran into a little trouble. With no horizon to go by—and naturally somewhat tired too—they ran a wheel through a tree at the end of the runway and got the scare of their lives. Romer Weyant of the Lenape outfit and Ed Butts were doing the refueling at Jacksonville and signalled them to wait a little bit. This they did and went up a couple of thousand feet, sleeping alternately to rest up. When they came down over the airport again for more fuel everything went off fine, but they waited until dawn before heading north as the weather was still bad and night navigation over the Carolinas is bad at best. Final departure from Jacksonville was at 5:00 a. m. They had nothing but the worst weather up the line, but hove into Raleigh at about noon for their last refueling. Here again the wind tried to play tricks with them but came through all right and took on 35

(*Continued on page 72*)

Payne Aircraft's New MC-7

These two close-up photographs show important features of the new plane. The engine mounting is novel. Note the clear visibility from the cockpit.

Photographs by N. R. Strohmeyer

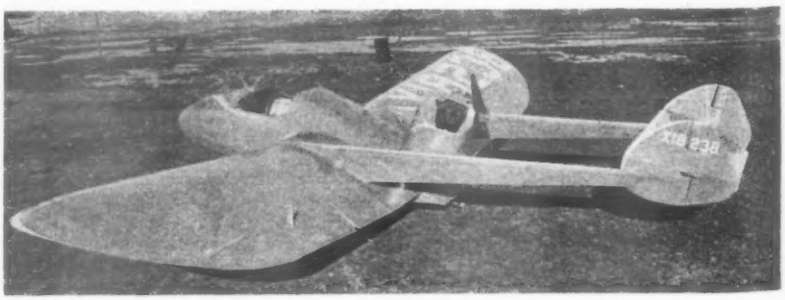
NEWEST lightplane scheduled for that prolific market is Vernon W. Payne's MC-7 monoplane shown above and below. Powered with a 50 h.p. Franklin air-cooled engine, the MC-7 now is being put through her test flights prior to applying for an Approved Type Certificate from the Bureau of Air Commerce. Preliminary reports on the ship have been favorable.

Vernon Payne, readers of POPULAR AVIATION will remember, is the man who designed both the *Knight Twister* and the *Sky Kitten*. The reason so little has been heard of the last-named designs lately, however, is because of the efforts being made to get the MC-7 ready for tests and (when and if an A. T. C. is awarded) for the market.

Many unusual characteristics are claimed for the new Payne ship. According to officials of that company, the MC-7 combines the features of the accepted lightplane with that of the novel aircraft introduced in this country not long ago featuring three-wheeled or "tricycle" landing gear. Though the Payne ship does not have the third wheel and is fitted with a tailskid, a special type of skid has been fitted to the underside of the fuselage to ward off damaging blows in faulty landings.

It can readily be seen from the accompanying photographs that the MC-7 has an unusual amount of visibility from the spacious-looking cockpit. That is one big advantage of all pusher-type aircraft. In addition, the twin tail-booms seem to make for economical manufacture. The MC-7 as a complete airplane is a combination of steel tubing, spruce with fabric covering and plywood. The leading edge of the 33 ft. 6 in. wing, from the rear spar forward, is covered entirely with plywood. From that spar back the spruce wing is fabric-covered. The fuselage is chrome-moly tubing back to the tail-booms (which also are spruce). According to Mr. Payne's statement, the MC-7 is 20 feet long, stands four feet, three inches high and has a wing area of 152 sq. ft. Mr. Payne said he figures his ship's top speed will be about 94 m.p.h. and cruise at 82 m.p.h.

This full-length view of the MC-7 shows her various unusual features. The fuselage itself is formed in the shape of an airfoil. The large wing area is notable.



Air-minded Oak Park boys and girls are surprisingly proficient when it comes to mechanics and engine-overhaul. Instructor Carleton (right) conducts all classes.

This powerful floodlight was built by the students for night flying operations.

A TOWN GOES FLYING

by BERNICE STEVENS

There's no telling what air-minded citizens can do if they try. Take Oak Park, Ill., for example.

WHEN an entire community becomes air-minded, lots of things can happen. You find housewives deserting dishes and bridge parties for the control stick of a student plane; business men studying Air Commerce regulations, and high school boys and girls spending all of their spare time at the neighborhood airport, instead of at the movies.

That's what has happened in Oak Park, Illinois, a suburb of Chicago. Here is located a community aviation school, which is believed to be the first in the country operated as a part of the municipal recreation program. Open to anyone in the community who wants to learn aviation from the ground up and to "fly for the fun of it," it is sponsored by the village playground board.

One young woman, an art teacher during her working hours, now has her amateur pilot's license. A 17-year-old boy is just waiting for vacation time so he can take the tests for his. A 16-year-old girl who, but a short time ago didn't even know how to drive a car, is now doing solo work on the *Cub* and soon will be ready for hers.

Although 21 students are now spending as much time as possible in the air and three times that many are hoping to do so soon, the project started out modestly enough. Most of the credit for its success goes to the head of the school, John T. Carleton, licensed pilot and ex-Marine, who has made his community aviation ideal a reality.

Less than two years ago he was given the comparatively simple job of teaching model airplane building in the playground system. But he saw further than just model planes built to scale by enthusiastic little boys. In his aviation ideal, he saw a community that gave the older boys and girls a chance to keep up with the modern age. He saw older boys who were thinking about their future vocations, boys who were looking for a worthwhile hobby, and boys who were just itching to get their hands on a control stick.

And he found, at playground headquarters, older boys who fitted perfectly into this picture. They hung around his model airplane classes and, while they watched youngsters gluing wings and struts together, they asked questions about real planes; asked about the horsepower in the engines, asked what it took to be a pilot. They wanted the real lowdown, they told Carleton. So he gave it to them by organizing the first class in ground instruction. He got them copies of Air Commerce regulations, talked rudiments of meteorology, helped them rig up a ground trainer. He got hold of a discarded engine and a few other parts an then set the boys at taking it down and putting it together again. But even that wasn't enough to satisfy them, and before long they were out at the field learning to fly his *Cub*.

The girls and young women didn't like being left out when they heard about it, and they demanded a class too. At first they thought that they wanted to be air sewardesses and this would be the first step in their career. But pretty soon they were helping the fellows take the engine apart and, before long, rode along with them out to the flying field. Now some of them hope to go into the sales end of aviation. Others are just sticking to it as a recreation and hobby.

Some of the parents came over to see what all this "hullabaloo" was about flying that occupied talk at the dinner table. Instead of yanking Johnny and Mary home "from such foolishness" as they had called it, some of them stayed to listen to class lessons. The result—a third class for adults which now includes several

husbands and wives, a doctor, a lawyer, several business men, a member of the fire department and representatives of numerous other occupations and professions.

The classes got so big and equipment began spilling over so in the quarters in an old store, that the school had to take over an abandoned fire station. Here the playground board furnishes the space, heat, light and water and the services of Carleton.

The Kiwanis Club liked the idea of providing such a worthwhile leisure time activity for older boys and girls so well that the members have taken this group under their financial wing. Last month they honored members of the classes at a banquet and furnished as a speaker, Capt. E. A. Stewart of United Air Lines, who talked on instrument flying. They purchased a band saw badly needed in the workshop and plan to furnish other needed equipment in the future.

Classes in the ground school are just about alike for all, regardless of age or sex. First, all aspirants must study Air Commerce regulations and Air Traffic rules and pass a written examination with a grade of 70 or better. High school students also have to keep up with their regular studies or drop out—a rule set by Carleton himself.

Later courses include meteorology, avigation, simple and elementary aerodynamics (that means the gals too) and mechanics. Although the latter is intended mainly for the boys, most any time you'll find several girls tinkering with the 550 hp. Wright *Cyclone* engine.

Saturdays and Sundays and a few mornings are devoted to flying instruction. Incidentally, the kids get a great kick out of taking off from the runway at Hines, Ill., which was the home landing field of Charles A. Lindbergh in the early days of the air mail. All those taking flying instruction in Carleton's plane pay $15 a year and $3.50 an hour for flying time. Purchase of a second plane looms on the horizon, due to continued applications for lessons.

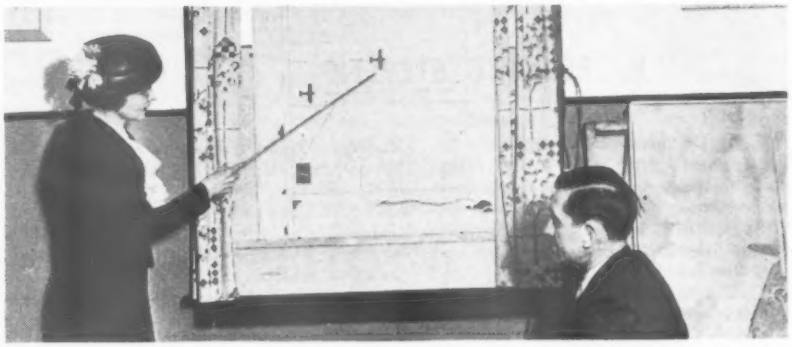
Carleton has pretty rigid rules too about these flying lessons, especially for those who get to the solo stage. He's told them that "only a fool does stunt flying" and anyone that tries it in his plane is out of his school and classes forever. Also, they come down when he gives them the signal to do so—or else.

So anxious are the students to start night flying, next project on the school schedule, that the boys got together and made themselves a 2,000,000 candlepower floodlight. They used discarded parts of a regulation floodlight, the base of an old x-ray projector, a new lens and built a series of control rings to cut out all but the horizontal rays. The girls' and women's group couldn't make a floodlight, so they pooled their movie money and bought navigation lights for the plane.

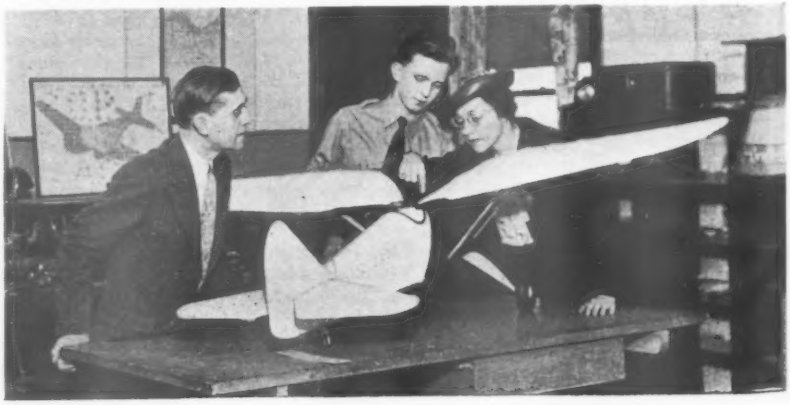
Since it is Carleton's hope to make this at some time in the near future a govern-

(*Continued on page* 81)

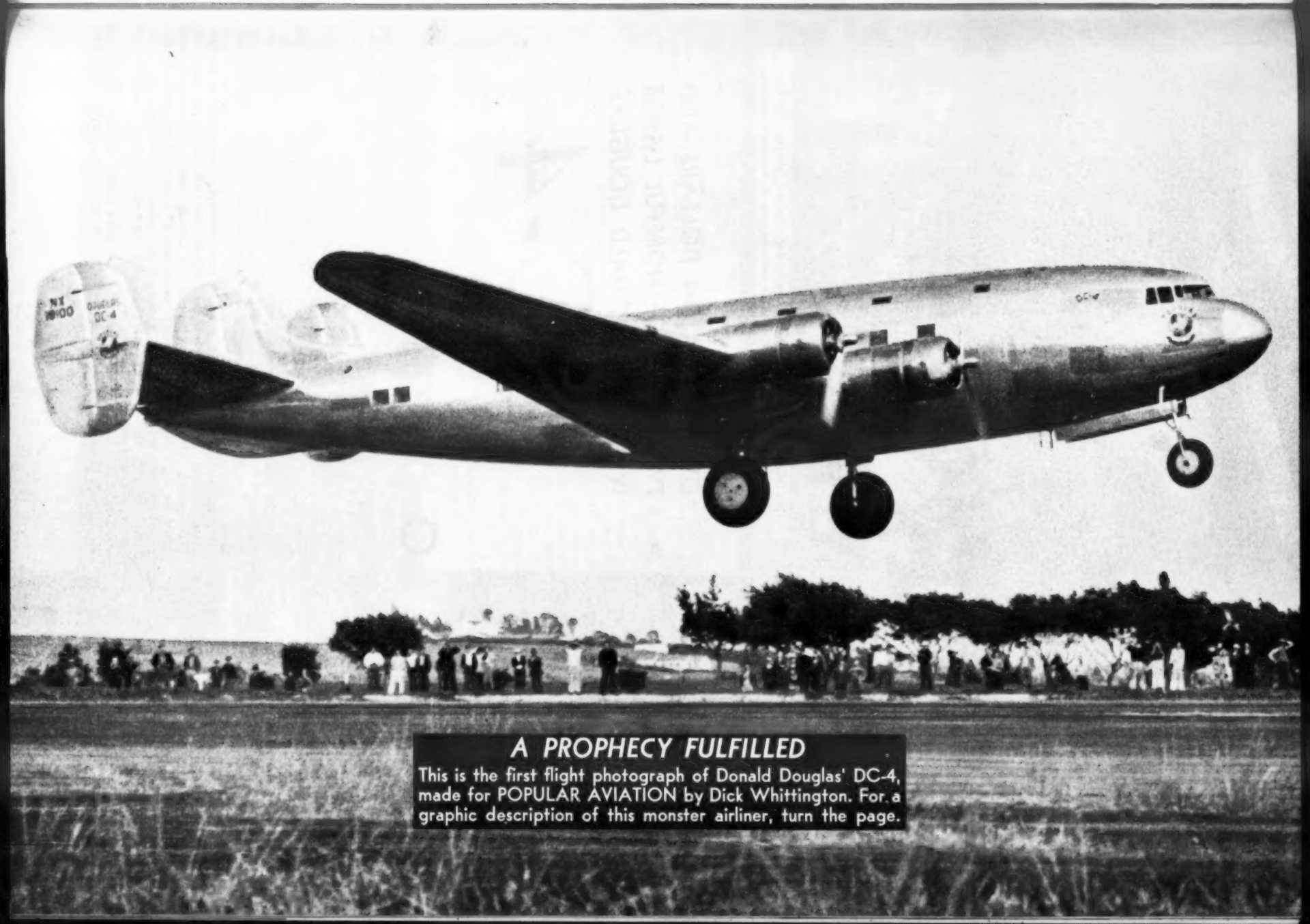
Carleton gives a girl student some pointers before letting her solo the Cub. The instrument below, built by the students, tests a would-be pilot's depth perception.



Even married couples are taking aviation instruction in Oak Park. This couple is checking air traffic rules (above) and fine points of plane construction (below).



An important part of the Oak Park ground school is the studying of gas models (right).



A PROPHECY FULFILLED

This is the first flight photograph of Donald Douglas' DC-4, made for POPULAR AVIATION by Dick Whittington. For a graphic description of this monster airliner, turn the page.

The DC-4's huge center-section is shown hoisted in place (above). The four engine-mounts can be seen. The ship's fuel tanks are in the center-section.

An outstanding and interesting feature of the DC-4 is the giant nose wheel (above).

Below is the DC-4's novel tail assembly. The bulge underneath is a steel tailskid.

OVER A MILLION DOLLARS AND TWO YEARS OF HOPEFUL LABOR WENT INTO DONALD DOUGLAS'

DC-4

by JAMES BASSETT, JR.
Aviation Editor, Los Angeles Times.

ON a bright, sunbaked field at Santa Monica, California, last month, Tomorrow became Today.

By shoving forward his throttle and kicking back—if you could call the operation of the electrical controls mechanism that—the wheel, Maj. Carl Cover, vice-president in charge of sales and crack test pilot for the Douglas Aircraft Corporation, made history. Or, rather, he wrote a triumphant concluding chapter to the epic of constructing the world's largest commercial landplane.

Funny, too, that Major Cover should write history backwards. For the 65,000-pound, four-enginer, colossus called the DC-4 thundered aloft when he pulled *back* on his stick. Other transports, carrying the usual two-wheeled landing gear and tail-wheel, hopped skyward only after the airman depressed his controls to elevate the ship's tail.

But such was the DC-4 as she flew on her maiden voyage last month.

She is no ordinary craft.

She represents something aviation's been long a-seeking: the wholehearted cooperation among America's Big Five airlines.

For two years the DC-4 (fourth Douglas commercial transport) has been the talk of the industry. From the time that United Airlines Transport Corporation, Transcontinental & Western Air, Inc., American Airlines, Inc., Pan American Aviation Supply Corporation, and North American Aviation, Inc. (at that time representing Eastern Airlines) signed the 9,000-paragraph contract for the construction of the experimental model, all aviation's land operations have been aiming toward that bright June day when the mighty ship actually took off.

Airlines' traffic departments, knowing that 42 passenger service was some-

Here she is—finished! Compared to the conventional airliner, the DC-4 is a queer looking craft because of her odd tail and nose wheel.

thing-just-around-the-corner, began to redouble their efforts to educate Mr. John Public into air-mindedness.

Airport executives began to cast calculating eyes over their runways—wondering whether the DC-4 (or any other comparable ship) could land there safely.

The job of "flight-engineer," added to those of chief pilot and first officer, became a reality in the airline game.

All this began on March 23, 1936, when delegates from the Big Five autographed the contract, signed for the Douglas firm by Donald Douglas, the man whose DC-2 revolutionized air transport. Of course, as everyone now knows, the contract was just a step in the process that originated with W. A. (Pat) Patterson of United.

Pat saw the vision in 1935.

With several score others invited to the "preview," I saw the reality May 30 —three years after Pat's efforts to unite the other four major U. S. airlines succeeded. What we saw was something so breathtaking in its conception it almost frightened one.

The only men who weren't uneasy were Douglas' smart young engineers. Arthur E. Raymond, vice-president and chief engineer, is typical of these. To his men, as the DC-4 trundled out of the world's largest single-span hangar behind a puffing little donkey-truck, he said:

"Rivet guns and slide rules worked hand-in-hand on this project."

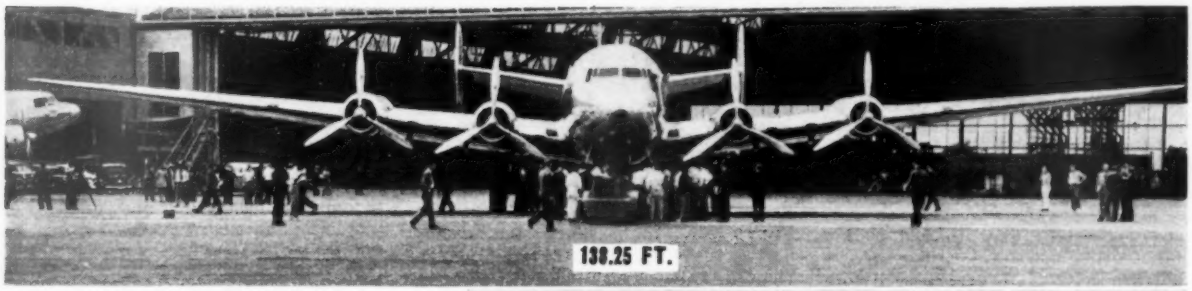
Now began the test flights for the 98-foot-long, round-bellied craft that had already made—in theory—three trips around the globe. Without leaving the gloom of her shop. Review hastily, here's what the hawkeyed Douglas engineers and Bureau of Air Commerce representatives faced when they started tests that were eventually to give the DC-4 her coveted ATC (approved type certificate) rating:

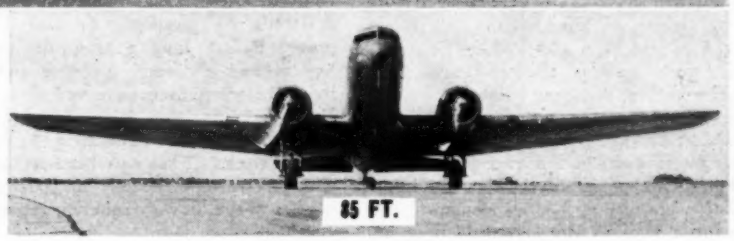
A dull silver-colored giant that measured exactly 97 feet, 7 inches from nostrilled (for cabin ventilation) nose to the tip of its triple (for stability and no wobble) tail; that spanned 138 feet, 3 inches from wingtip-to-tip and whose single, low pinion covered the astounding total of 2,156 square feet; that stood 24 feet, 6½ inches high from the bottom of her pneumatic rear tires (65 pounds pressure) to the curved dome of her cabin roof.

Here are a few more pertinent statistics

(Continued on page 76)

Brute power—1,500 h.p. of it. Engines and props on DC-4 are military secrets.





These two pictures are approximately to scale. Compared to the DC-4, the American Airlines DC-2 in the lower inset is just a bit larger than a sport plane. The two photographs also show the difference between the conventional tail-down ship and the DC-4's nose-down position. Because of the size of the DC-4 there has been much controversy over its ability to get in and out of present fields. Engineers, though, say it will outdo the DC-3.

Popular Aviation Designs Navy Insignia

TO POPULAR AVIATION's art department goes credit for designing the insignia shown on this page. When Lieut. G. A. T. Washburn, (until recently in command of the Naval Reserve Aviation Base at Glenview, Ill.) expressed the need for a squadron insignia, POPULAR AVIATION offered to work out some preliminary designs from which pilots and enlisted men could make their selections and suggestions. Close to 50 ideas were worked up. Only basic idea that seemed to strike home was the including of the Great Lakes' outline in the design. This eventually evolved itself into the insignia finally approved by the Navy Department in Washington.

The bomb itself is jet black with the Great Lakes in light blue. The official Naval aviation star is at the foot of Lake Michigan, denoting Chicago's position on the map. The bomb's burning fuse is red, as is the dot in the center of the star.

The ship shown below is one of the squadron's Grumman FF-2 two-place fighters. The insignia also is on the squadron's three Berliner-Joyce OJ-2 observation ships. According to Naval officers, several new Curtiss SBC-3 scout-bombers have been earmarked for the Chicago squadron (based at Curtiss-Reynolds airport at Glenview) and the insignia will be painted on the new warplanes at the Curtiss factory in Buffalo.

Meanwhile, Lieutenant Washburn has been transferred to duty with the fleet at San Diego, following the termination of duty as commanding officer of the Chicago base. Lieut. (jg) James G. Sliney, base executive officer, is in temporary command.

Beetles Battled by Plane

NATURE has her little joke now and then. That she had recently, though, took some high-powered air transportation to overcome. It all started with some banana plantations in Jamaica.

According to POPULAR AVIATION's correspondent in Brisbane, Australia, the banana growers in Jamaica suddenly awoke one day to find a new kind of grub, laid by a certain beetle, had taken a liking to bananas. Before long, most of the banana plants in Jamaica had been attacked. The planters were frantic. Before long, their entire harvest had been ruined. But there was even graver danger: the next harvest would be ruined in advance unless something was done in a hurry. One of the planters happened to recall some information concerning beetles he had picked up on a visit to Europe some time before. He remembered that a certain kind of horned beetle was a deadly enemy of the banana beetles and killed them off as fast as possible.

Cablegrams flashed back and forth across the globe. All zoological authorities within cabling reach were called for help. None could supply the horned beetles until—an affirmitive reply came in from the Dutch East Indies. More cables. Australia was notified. So was Singapore. Before long a crate of horned beetles was abroad a speeding airplane flying between Singapore and Brisbane. From Brisbane they were shipped post-haste to Jamaica. They arrived "in the nick of time." That new banana harvest will survive only because 100,000 horned beetles were flown from Singapore to Brisbane.

Oooooh!

OVER in England, Imperial Airways is forced to maintain what they call a "foreign correspondence department" because of the various nations with which they deal daily. That department considers itself proficient in the handling of correspondence, regardless of the language it is written in. But, just recently, Imperial Airways' proud department took a terrific setback with the receipt of a letter written in a language not even the ablest expert could decipher.

Being thorough airline operators, Imperial experts took it for granted that the letter was from a prospective customer. So they bent every effort to find out what language the letter was in and what it said.

One foreign consulate after another was called upon to try its hand at deciphering the mysterious letter. Each failed. Finally, with Imperial's experts almost in despair, someone suggested the name of a firm that specializes in little-known languages. After the expenditure of several pounds Sterling—in addition to many hours of time and effort, the translation came back with a note saying the language was an obscure Slavian dialect. The translation:

"Dear Sir, I beg to apply for a position with your Company as a labourer."

F.T.C. Cracks Down

A COMPLAINT had been issued, as this issue went to press, by the Federal Trade Commission charging William J. Cressy and Effie M. Robertson, trading as Flying Intelligence Service, 2521 North 56th St., Milwaukee, with unfair competition in connection with the sale of a manual of instruction and information concerning the United States Air Service.

The complaint alleged that the respondents' aviation manual, which they sold for $3 a copy, contained substantially the same information as that published in a pamphlet called "Flying Cadets of the Army Air Corps," which is furnished free by the Air Corps to anyone asking for it.

In order to promote the sale of their aviation manual, the respondents allegedly represented in classified advertisements that they conducted a flying school, offering training in aviation; that they were affiliated with or sponsored by the United States Air Corps, and that they would provide jobs for men who are willing to work for $75 a month while in training. According to the complaint, the respondents, who were engaged in the business of selling an aviation manual, did not operate a flying school or train men in aviation; they had no connection with the United States Air Corps, nor did they offer jobs to aviation students.

The respondents are allowed 20 days to answer such complaints.

That Man —WEEMS

by JOHN C. A. WATKINS

To most people in aviation there's only one man so well-versed in navigation: P. V. H. Weems, the man who makes famous flyers famous.

Amy Johnson, British aviatrix, studied with Weems.

COMMANDER PHILIP VAN HORN WEEMS is much too modest.

Otherwise, perhaps more of the thousands who read (in the May issue of POPULAR AVIATION) that letter in which the late Fred Noonan described the problem of navigating the Pan American Clippers across the Pacific, would know a little more about the man to whom he wrote.

Why should Noonan, a busy man, have taken the trouble to sit down and pen a long, technical description of those navigational problems and his experiences along that line to this retired naval officer?

Because Noonan was following the old custom of student reporting to master; he, and many another famous American and foreign transoceanic flyer, received much of his knowledge from the man who is described as one of the world's greatest authorities on aerial navigation.

The roster of men and women who have studied navigation under Commander Weems, either at his school in Annapolis or by mail, reads like *Who's Who in Aviation*: Lindbergh, Amy Mollison, Lincoln Ellsworth—dozens of aviation "names" have studied under the commander.

That's why it is strange that so few people have ever heard of him and his little school, on the banks of Maryland's historic old Severn river, hard by the United States Naval Academy, where he graduated 26 years ago.

My business is to know what's going on in aviation in the world, and especially in my own backyard, but I'm forced to admit that, until recently, the name "Commander Weems" aroused little response in my mind. I knew that a special navigator's watch had been designed by a "Commander Weems," because Neil Richardson, first officer of Imperial Airways' flying boat *Cavalier*, in the Bermuda service, had shown me one that he had been asked to try out.

Then, not long ago, Amy Mollison came all the way from England to Annapolis, and spent long weeks at the Weems home, studying with the commander. That made me decide that this gentleman must be worth looking into. The editors of POPULAR AVIATION thought so too.

How Commander Weems came to be the dean of American aerial navigators, and the peer of them all, is not a long story, nor is it particularly exciting. To begin with, navigation was hardly a problem to the average aviator when he and Richard Evelyn Byrd—who most of us know now as Admiral Byrd—graduated from the Naval Academy. As any aviator—vintage 1912—can tell you, the major problem was remaining in the air. In all probability, young Weems hardly thought of airplanes during his four years at the sea school, and he certainly had little or nothing to do with them when he was a junior officer afloat and ashore.

The entry of the United States into the World War may have been the turning point in his career, as it was in many ways for many a man: at its outset, he was ordered to take the post of engineering officer on a destroyer convoying troops across the Atlantic.

There were the usual enemy submarines and their torpedoes to dodge, but probably, the suspense of this flirtation with a "heroic" death was as nothing to the way Weems must have felt, years later, knowing that the life of a man winging his way across a lonely ocean depended largely upon the skill that the pilot had acquired from him.

Weems escaped the war without damage, but very nearly had his career ended shortly after the armistice, when his ship followed another destroyer onto the rocks in the English channel.

Commander Weems had gone to bed while the two destroyers were headed south for Brest, when the leading ship suddenly stopped dead—high and dry on the rocks. His destroyer changed course quickly, barely avoiding joining the first in its last berth. It was too late, however; the *Murray* scraped bottom, and had her hull badly torn. Both ships were towed to port.

Then came the event that changed Commander Weems' life course, had an untold influence on the development of transoceanic flying, and gave him a limited fame among that little group of well-known pilots who made it their business to blaze trails across the oceans.

He was assigned as executive officer and navigator on the *U.S.S. O'Brien*, one of the destroyers that were strung out across the Atlantic to act as guard and base ships for the transoceanic flights of a squadron of Navy seaplanes in 1919, of which only Captain A. C. Read's flying boat succeeded in completing the trip.

Although the airplane did not stop alongside the *O'Brien*, instead just passing over and checking its bearings before continuing on toward Portugal, it set the young officer to thinking about what he believed must be a major problem for a transoceanic flyer—how to guide his airplane across the trackless waste without benefit of radio.

He knew that the only solution must be dead reckoning. That the pilot must set his course by compass and map, then fly at a standard speed for a standard time, determine his approximate drift, and, by applying all these facts, approximate his latitude and longitude—not exactly, of course, but near enough to accuracy for those days.

He began studying these problems, and was aided by Captain Read himself, who told him, some time later, that an emergency arose on the flight when a take-off bump jounced the NC-4's compass out of its gimbals.

Captain Read explained that this resulted in the compass face and compas needle not synchronizing, thus giving false readings, and that the airplane was unknowingly headed straight for the coast of Africa. When they missed the first base ship, they decided that the ship and not the plane was out of position.

But then the second destroyer failed to appear on the horizon where they thought it should have appeared, so they became suspicious and checked their instruments. The found the trouble and restored the compass to its proper position on the gimbals.

With a bubble sextant, Captain Read and his crew would have had no trouble turning back to their proper course, but there "weren't no sich animal" in those

(*Continued on page* 94)

America NEED NOT BE VULNERABLE

by

LIEUT. A. G. J. WHITEHOUSE
Former Royal Air Force Officer.

America is vulnerable to air attack—but it is our own fault. Lieutenant Whitehouse offers the following answer to the threat.

LAST month I attempted to explain the position of the United States in relationship to its vulnerability to an air attack by any major power. I showed how certain foreign forces, suitably equipped with long-range aircraft or operating from aircraft carriers, could, under certain conditions and under a variety of excuses, stage successful raids on important focal points with varying degrees of effectiveness. I pointed out that many key-industry manufacturing centers were unfortunately close to the borders or coastlines and that most of our important aircraft manufacturing concerns were situated well within reach of any power that decided to force war upon this country.

In the same article I explained how foreign powers could, and are obtaining the equipment necessary for such an attack; why they might consider attacking this country from the air and what the probable result might be.

Of course much of this argument is theoretical. It could be nothing else. We who write these articles can only attempt to interpret current events and shape their ultimate conclusions. To these conclusions we can only apply the lessons of war we have learned, incorporating the materials such as guns, men, machinery and public morale into the scheme and play a game of soldiers.

However, we do have certain vital facts and certain indisputable laws that work in our favor. We have certain tables by which to compute and a few of us believe we understand certain nationalistic traits to the extent that we can presage what can happen when armed forces are hurled together.

Collecting this data then and first analyzing what possibly can happen, as in this matter of the vulnerability of this country to air attack; there is no reason why we cannot reshuffle the same data and tables to see if we can find an antidote. In other words: "What can America do to prevent these threatened air attacks?"

According to Maj.-Gen. Frank M. Andrews, commanding the GHQ Air Force of the Army Air Corps, air attacks cannot be stopped by any means now known. This high ranking officer should know what he is talking about, but he may be a trifle prejudiced in favor of his own weapon—the bombing plane. He also believes that pursuit aviation is an effective anti-aircraft weapon, but since the pursuit plane requires certain characteristics which make it effective such as speed and a high rate of climb; it is reduced in range until it can be nothing but a weapon of local defense. We should add that Major-General Andrews is usually full out for the Boeing B-17 as the basic type of the air service.

If we accept the bland statement that no air attack can be stopped, we might as well fold up now and issue the population with gas masks and shovels.

Major-General Andrews is not alone in his opinion of anti-aircraft defense. Air experts all over the world usually make the same statements, and often they present convincing arguments.

But let us look at the actual facts

Amazing records of accuracy have been turned in by the modern anti-aircraft machine-gun. High powered ammunition reaches great heights.

Photographs by U. S. Army

Americans got a thorough look at their anti-aircraft defense during the recent Army maneuvers in New England. Above are magnesium flares being dropped from raiding ships.

concerning anti-aircraft defense.

(For the opinions of Major-General James E. Fechet, former chief of the Air Corps now retired, on this subject, see pages 30 and 31, POPULAR AVIATION *for July, 1938.—The Editors.)*

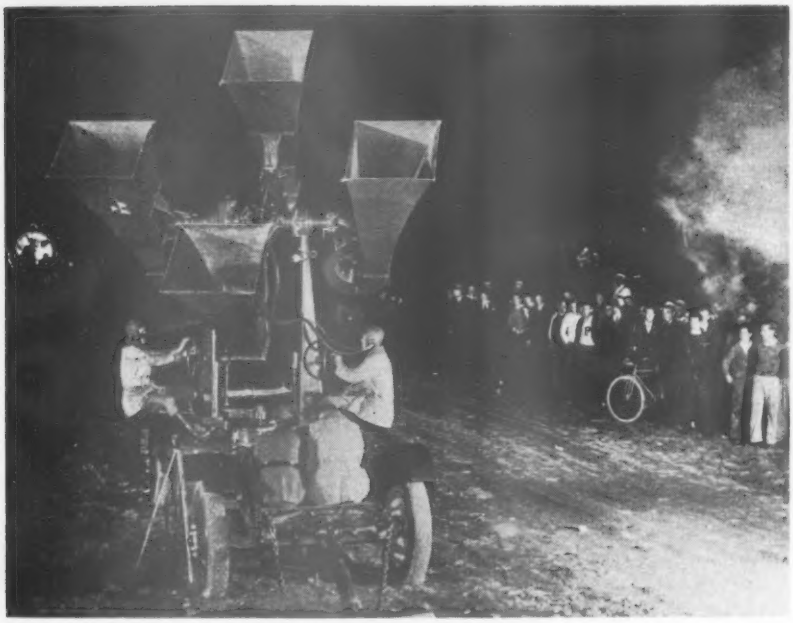
As I have probably told you before (and no doubt bored you with my own personal opinions) I was one of the lucky ones who came out of the World War with a few hundred hours of active service flying over the line. Through 1917 and 1918 I saw plenty of anti-aircraft defense and had a healthy respect for it, such as it was 20 years ago. I have seen direct hits and have ducked Archie for hours. I carry the scars of anti-aircraft shelling and know what it is to go down with a disabled plane as the result of anti-aircraft fire.

If airplanes have improved from 130 m.p.h. to over 400 m.p.h. in 20 years, it stands to reason that anti-aircraft efficiency has improved at the same ratio. Or do the aircraft designers have a monopoly on brains? If anti-aircraft of 1918 was considered fairly effective up to 12,000 feet—and I can vouch that it was—isn't it reasonable to assume that the guns and gunners of 1938 have improved on their efforts to *some* extent?

I agree that since plane speed has been more than doubled the anti-aircraft gunners' problems have been increased in proportion. But any enemy formation attempting to attack any single strong point on the United States territory still has to come here and fly *over* the objective. Until we are *certain* that there is such a thing as a silenced plane, there appears to be no way in which this theoretical force can avoid being "ranged".

It is true that most first-line aircraft today have service ceilings of well over 20,000 feet, but no flight-commander would attempt to bomb a target from his service ceiling. Bomb sights at the best are none too efficient and any attempt to hit a target from 20,000 feet could only bring an actual effectiveness of about five per cent. To make any air attack worth while a 12-ship formation would have to bring at least 250 lbs. of bomb load. Out of this amount, then, from 20,000 feet they could only figure on the destructive power of about 600 lbs. of bomb weight.

At the present time there are no reliable figures on the effectiveness or accuracy of modern bombing. Those we get from the annual tests are all made under ideal conditions and under Group competitive operations. It must be remembered that no defense is being put up against the bombers. There are no anti-aircraft guns to fire at them and



Modern "electric ears" can detect the approach of aircraft at a distance of several miles. This basic device was first used against aircraft during the World War.

no defensive fighters to harass them. There is practically no time limit and most practice bombing tests are made from ridiculously low heights. Bombing as staged in Spain and China come in two categories: first, where there is no opposition; as in Barcelona. Or where there *has* been opposition, such as has been experienced in a few cases in China. In the first we find what might be considered fairly effective scoring but in the other, the bombers did just as we did in 1917-18—got as close as they dared and pulled the toggles to get rid of the damned things.

In other words, there's a world of difference between bombing a chalked-in diagram on a desert or a bombing range and the actual wartime target. Only a few, regardless of nationality, ever come down low enough to get the best out of their sights—and get back again.

This then is the first big problem of the invader. He must fly in at a suitable altitude to score hits, and in doing so he automatically places himself in the vulnerable zone of anti-aircraft fire. Anti-aircraft defense in the United States happens to be particularly good. The crews are well trained and in most cases are carefully selected men who fit the particular job. Anyone who ignores this point is either a fool or a rank ignoramus.

The United States anti-aircraft artillery is equipped with guns equal in caliber, muzzle-velocity and maneuverability to any in the world. In addition these guns are automatically ranged and fired by the famed Sperry Director, a "magic-brain" device which finds the oncoming raider, computes its speed, height and direction. Once this problem has been automatically figured the gun is elevated and the shell fuse set for the computed range.

How effective is this device?

Well, recently a test was made on a towed target, a sleeve target towed by a high speed plane at an altitude of about three miles. Fifty-nine shells were fired and 14 direct hits were made on the small sleeve. The gun, a three-inch weapon is said to have an effective range of five miles.

For night action ultra-modern searchlight batteries using 800,000,000 candlepower are capable of illuminating a moving target eight miles away. These giant searchlights are operated by remote control, being elevated, lowered and turned by electricity supplied by a generating plant built as an integral part of the truck that carries the light.

It is usual—at least in theory—that an attacking force sends down a flight of low-flying attack planes to pepper the searchlights. This particular feature of aerial warfare has always gone over big in the fictional history of World War raids, but unfortunately there are no records to substantiate such hair-raising gallantry. However, in case our theoretical enemy *does* attack the all important searchlights, the crews are provided with special .50 caliber machine guns equipped with secret night-firing sights. They also fire tracer bullets, which if they are not as effective in penetrating power as regular cupro-nickel, they at least give the enemy pilots something to *see*, and something else to worry about.

With the rest of the accepted equipment such as detector horns for the initial spotting of the raiders, horizontal direction finders and the Sperry Director, the United States anti-aircraft artillery is more than capable of taking care of its part in the defense against enemy raiders.

What we can't say at this point, of course, is *how many* such batteries are available and how well they are distributed. But any battery, given a reasonable area to defend against flying equipment of equal efficiency with regard to modern standards is quite capable of putting up an effective defense.

To state that this defense would be 100 percent effective would only be rank blatancy. A four-gun three-inch anti-aircraft battery working under active service conditions and with reasonable warning, should be able to destroy, damage or partially disable at least half of a 12-ship formation attacking under accepted conditions before they could reach their target. Of the six left, two or three might actually reach a point over their objective and release their bombs. Of these three one might score direct hits while the other two, still evading the anti-aircraft defense and holding a certain formation position, will struggle through the motions of bombing action with a very low percentage of effectiveness. The other three, human nature being

(*Continued on page* 88)

One of the currently-used defenses against invading aircraft is the high-powered anti-aircraft machine-gun mounted on armored cars. Mobile units are highly effective.

The pride a loyal Englishman holds for his Royal Air Force is a formidable sight. Equally proud is the Briton of his potent Hawker

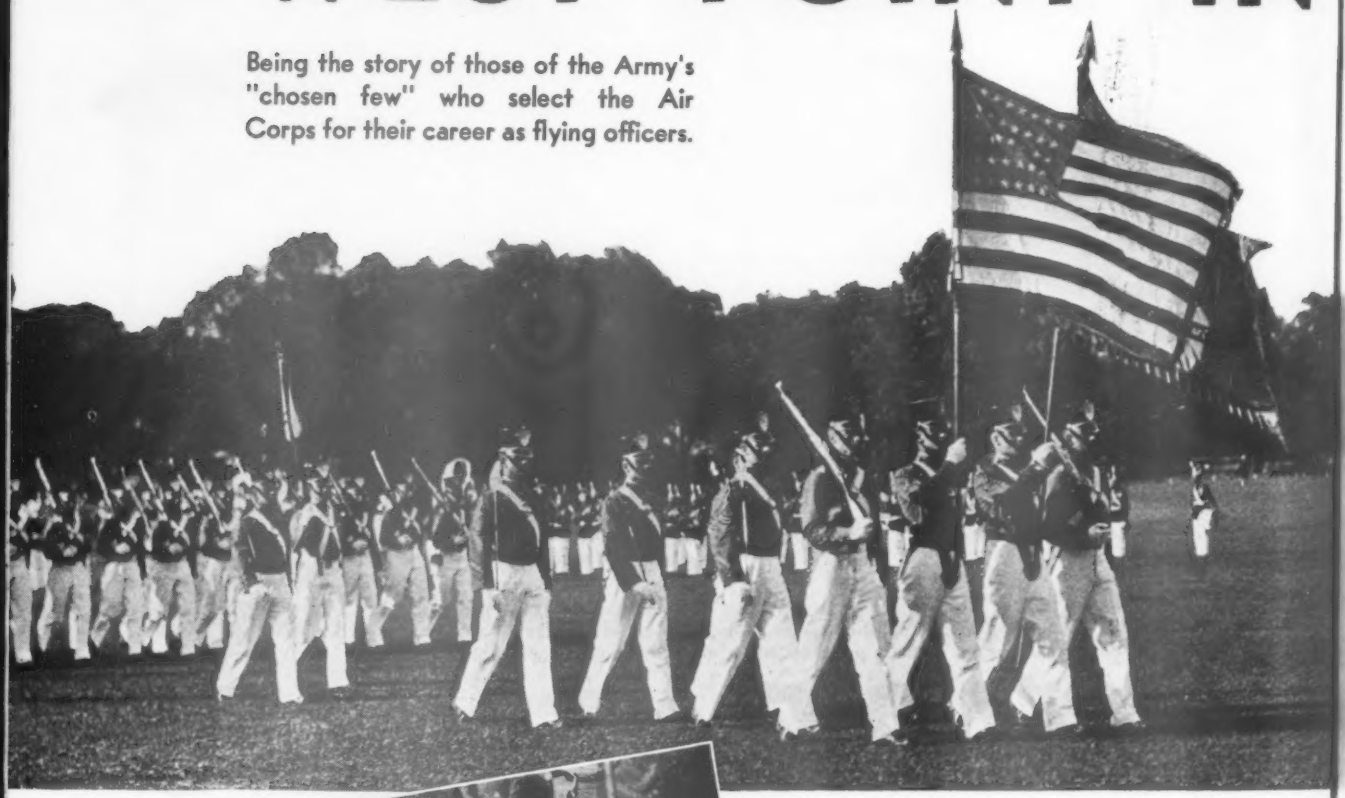
HURRICANES

which he believes—and rightfully so, perhaps—to be the fastest fighting airplanes currently in service use by any air force on earth. It was a Hawker *Hurricane* that flew 327 miles in 48 minutes at an average speed of 408.75 m.p.h. during a ferrying flight one night not long ago. Not a racer, though, the *Hurricane* is a fighter armed with eight machine-guns and a 1,050 h.p. engine. This remarkable airplane has a top speed of about 335 m.p.h., cruises at about 300, lands at 60. The *Hurricane's* service ceiling is 39,000 ft.

"Flight" photographs

WEST POINT IN

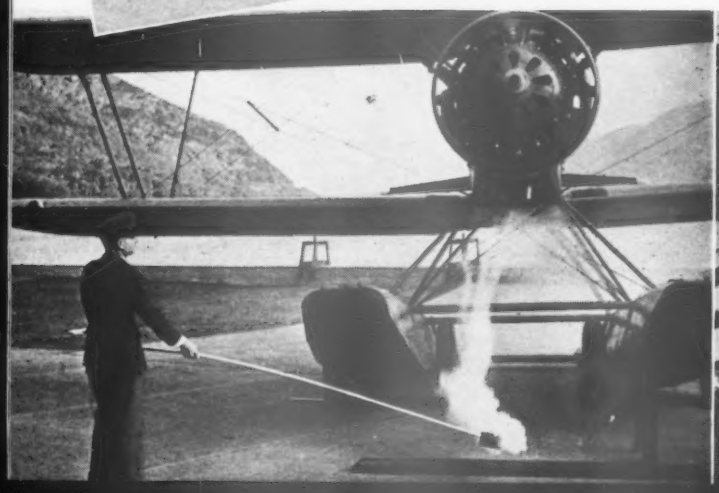
Being the story of those of the Army's "chosen few" who select the Air Corps for their career as flying officers.



In the above ranks of West Point's far-famed cadets march many of the Army Air Corps' flying generals of the future.

The lounging airmen at left actually are West Point cadets awaiting their day's flight training with Army instructors.

West Pointers get ground instruction below. The officer (below, left) is demonstrating airflow around an airplane.



THE AIR

By ROGER F. PARKHILL

Photographs from Cadet Prescott M. Spicer, '38

Mitchel Field, down the Hudson from West Point on Long Island, is the favored spot for air-minded cadets. The above cadet is inspecting an Army Martin B-10B bomber.

EACH year, during the hot weeks of July, there is a roar of engines and a glint of golden wings over the stately Hudson. Up in formation from Long Island, over the stony Palisades, past the grim ramparts of Storm King Mountain, the G. H. Q. squadrons from Mitchel Field fly daily on their training flights to West Point and beyond.

It is the training season for the cadets of the first class at West Point, and officers and personnel of Mitchel Field spare no pains to impress the future Army officers of the vast possibilities of a career in the Air Corps upon graduation.

The graduating West Point cadet who chooses the Air Corps for his career as an officer has a definite advantage over the college man who enters the service. For the West Pointer not only has acquired valuable mental and physical characteristics in his four years at the academy, but he also has the heritage of being a graduate of the world's finest military school, the United States Military Academy.

If any young American between the ages of 18 and 22 has an ambition to pursue a career as an officer but finds it impossible to finance himself for at least two years at a university, he should by all means attempt to enter the United States Military Academy. Contrary to popular opinion, entrance requirements to the military academy are not as exacting as the entrance requirements to Randolph Field, for a college education is not required. Congressional examinations are usually given out by civil service competitive examinations and are not difficult to obtain if the applicant is a high-school graduate and possesses a capacity for study.

Perhaps the most practical method for a young man of limited means to obtain training for entrance to West Point is through the regular Army as an enlisted man. Applicants for entrance to West Point may enlist for only one year, part of this time being spent in preparatory schools established in each corps area under the supervision of regular Army officers. The training received as an enlisted man in an Air Corps squadron and in an Army preparatory school usually proves of great value to a man, regardless of whether he enters West Point or not.

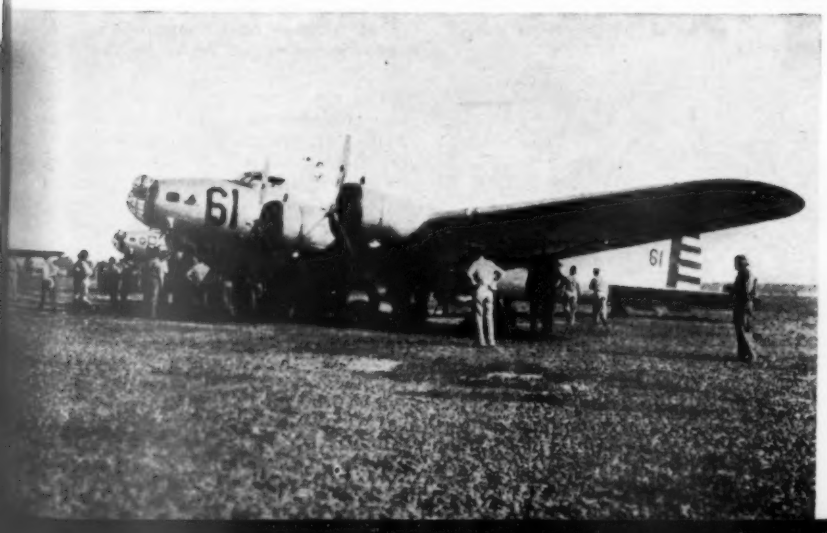
While at the academy, the cadet finds his life closely regimented, studies hard, and discipline exacting. Very little in the way of aviation training is offered in the first two years at the academy, but the applied training a man receives will be a valuable asset to him throughout his life. At the end of the rigid fourth class or "plebe" year, he usually finds that his body has developed amazingly, that his mind has become more alert, and that he has gained a self-confidence he had never before possessed. Even if he fails to survive the course and is "found" out of the academy, he has developed principles which could not have been as quickly nor as permanently acquired in civilian life.

A cadet receives his aviation training during his last two years at the academy. During the second-class year, a comprehensive course in elementary aerodynamics is studied as a part of the two-year course in philosophy. The course includes a history of aviation, design of the airplane, calculation of performance, and subjects related specifically to military aviation. The course is augmented by lectures and demonstrations by the officers of the West Point Air Corps detachment.

The Air Corps detachment, consisting at present of five officers and eight enlisted men, is equipped with only two planes, a Douglas BT-2 on floats and a Douglas OA-4 twin-motored amphibian, both operating off the Hudson River. The hilly location of the academy renders it impossible to use land planes, but the cadets gain much valuable information from the practical demonstrations offered by the detachment. For many of the cadets, it will be the last time they will ever come into contact with seaplanes during their long tour of duty after graduation.

Immediately after graduation in June, the new "make" list is read, the sec-

A chance to get a close-to look at some of the Army's Boeing "Flying Fortresses" was a rare treat for West Pointers. Officers are describing the ships (below).



This West Point cadet found plenty to amaze him in the wheel-housing of a B-17.

West Point from the air is an imposing sight. This view, shot on an aerial photo mission from Mitchel Field, shows a few of the main buildings at the academy.

ond class leaves on their well-earned summer furlough, and the third and first classes move to Camp Clinton for 2½ months of joyful recreation and intensive training. During this last summer in camp, the first class participates in a series of field artillery, coast artillery, cavalry, and infantry hikes; spends a glorious month of training in the south at Forts Benning and Monroe; and (the most anticipated trip of all), experiences a week of practical flight training at Mitchel Field, Long Island, New York.

In order that the cadets may receive the maximum amount of good from their week of flight instruction, the first class is divided into details, one detail at a time leaving for Mitchel Field. The first day out of West Point is spent in the long trip to Mitchel Field by truck convoy, getting settled in barracks, and becoming acquainted with the personnel and layout of the post. Cadets are informed that only a certain amount of personal freedom is allowed; that they are restricted to a reasonable area outside the field which, however, does not include New York City. Nevertheless, one or two enterprising cadets each year desert the hospitality of the post some dark night, steal away to New York to taste the forbidden fruits of the gay white way. Such misdemeanors rarely go undetected under the watchful eyes of the tactical officers in charge, with consequent punishment for the culprit on return to West Point.

Each day is carefully arranged in schedule to give the cadets a comprehensive idea of Air Corps work. Long flights up the Hudson River in big bombers and speedy pursuits; hours of general ground and radio instruction; experiments in packing and testing parachutes, and many informal talks with pilots and enlisted personnel comprise the cadets' week at Mitchel Field. And, despite the involuntary loss of many meals, the looks of regret are as many as the truck convoy

(*Continued on page* 91)

Left is a West Point cadet on a high altitude flight from Mitchel.

The group of West Pointers below is on an aircraft inspection tour.

Air Corps Needs Cadets

BRIGADIER General H. H. Arnold, Assistant Chief of Air Corps, in discussing the current shortage of Army flying cadet applicants, stated:

"Only yesterday an airline executive told me that he would take fifty co-pilots for his airline at once if he could get them, at a beginning salary of $200 per month with assured promotion and salary increases. He expressed a desire for men who have graduated from our flying school and who have completed the flying service in our squadrons.

"It must be that young college graduates in this country do not know of the opportunity available to them of obtaining flying instruction in one of the finest flying schools in the world followed by two to five years active duty in our tactical units, otherwise undoubtedly we would be flooded by applications. Not only are our flying cadets given instruction free and furnished food, shelter and clothing while learning, but they are paid $75 per month while in the school and the pay of flying lieutenants while in our squadrons."

Army Air Corps officials pointed out that men between the ages of 21 and 26, possessing two years' college education, or who are able to pass an examination which requires the equivalent, and who can pass the physical examination are admitted to the Air Corps Training Center, San Antonio, Texas. Application blanks are obtainable by writing to the nearest Army Corps Area headquarters or to the Chief of Air Corps, Washington, D. C.

There is less competition for admission to the March class, officials pointed out, than to subsequent classes during the year after June graduations from the colleges make many more applicants available.

Britain's Latest

FOLLOWING a general American practice, Britain's Short Bros. factory has just announced the completion of the first Short *Sunderland,* which is merely a military version of the famed Short "Empire" flying boats now used by Imperial Airways on its international services (including the Bermuda-New York line).

The old American custom of "killing two airplanes with one slide-rule" has, it appears, penetrated overseas. Hence, the *Sunderland* follows *Centaurus, Cambria, Ceres* and the other flying boat airliners in that class by being equipped with four Bristol *Pegasus* engines and generally being an all-metal high-wing cantilever monoplane flying boat.

From wing-tip to wing-tip the *Sunderland* measures approximately 114 ft. It is 85 ft. long and 33 ft. high. It will be used by the Royal Air Force as an open-sea reconnaissance boat. Gun turrets are in the nose and tail.

Ice Cap Pilot

Photographs from Leonard Delano and L. F. Barr

Few airline pilots in the United States would relish flying over this terrain.

Lucien F. Barr, the Ice Cap Pilot.

by
LEONARD DELANO

Presenting the story of another of those intrepid Far North airmen.

PILOT LUCIEN F. BARR had been missing for about 10 days. His route lay between Whitehorse, a little town south of Dawson in the Yukon territory and Fairbanks, Alaska. The weather was not so good part of those ten days. The other part of the period was plain lousy with snow, low overcast and several stuttering attempts of the weather to even rain, as it frequently does along about springtime in the interior north country.

Most of Barr's friends at Juneau, Alaska, from which he had taken off, knew of his ability to cope with tough situations where less versatile pilots might otherwise fail. They thought nothing of the delay at first, but as the days lengthened into a week and he was unreported at Fairbanks some grew apprehensive. So when a rumor assumed dimensions of a certainty at Fairbanks, a report was sent over the radio to Juneau where the *Daily Empire* published it. "Barr reported dead," said the story. The next day the editor of the *Empire* was astonished to receive a telegram from Barr himself at Fairbanks, reading:

"Am interested in getting details of my death. Please advise at once."

Barr, whose grin was a familiar sight to the editor of the *Empire,* no doubt grinned plenty when he sent that telegram. Being snowbound for more than a week—most of the time without much grub—was not sufficient to squelch his humor.

Many northern pilots have had the experience of being forced down in isolated sections such as in this instance of Barr's. But few have pulled out of tight places in such novel methods as he has. At least not very many have used planks for skies such as Barr did that time near Mary Joyce's lodge on the bank of the Taku river.

It was on one of his trips over the Ice Cap, about which we shall enlarge shortly, that Barr was coming back from Atlin, British Columbia, to Juneau. Between Atlin and Juneau lies the coastal range of mountains which runs north and south along Alaska's southeastern panhandle and which forms an impregnable barrier to ground travel in all places except at Skagway, the Taku river and the Stikine river. The Taku, "just around the corner" from Juneau, is open

This is the DeHavilland "Gypsy Moth" which Barr had to patch up in the wilderness after a gust of wind blew it over on its back. He pauses (above) to blow his nose.

". . . At the end of three days Barr's plane was almost covered and surrounded by snow, in spite of the fact that he had lightened the load on the wings several times . . ."

to river boat transportation on only its lower channel, where Bill Strong manages to navigate the treacherous rapids past Mary Joyce's isolated lodge and up the narrow canyon to Tulsequah, a trading post.

Visibility was good when Barr left Atlin, but as he crossed the international boundary line saw he would have to follow the route of the Taku canyon. A storm was "dusting" the waters of the Inside Passage ahead of him and he knew he would be unable to round Pt. Bishop to Juneau, so he made an emergency landing with his wheel landing equipment alongside the lodge.

That night snow fell as only snow can fall in that section of the country when the weatherman has his mind made up. At the end of three days Barr's plane was almost covered and surrounded by snow, in spite of the fact that he had lightened the load on the wings several times.

To take off required a snow shoveling feat of no small size. Runways for the wheels were cleared for a short distance, but skis would be necessary to finish the run over the snow. It would probably be a couple of months before he could get a pair of skis to the lodge with the spring weather holding up the river boat. So indomitable Barr tore a couple of stout planks from a nearby shed, tapered them somewhat with an axe, added a bit of tin on the front ends, and set them under the wheels of his *Pilgrim* monoplane.

His take-off, while a bit unorthodox, was close to perfect. The "skiis" fell from the wheels at the take-off as Barr had planned, and he landed nicely at the field northeast of Juneau.

Such versatility among birdmen is acquired in no place in the world as it is in Alaska, at least in the opinion of the writer—who has flown with many of them. And among the experiences of pioneering northern flyers this little gem of taking off with planks for skiis is one of the best.

An emergency landing field farther up the Taku river on a muskeg flat on another occasion in bad weather called for slightly different technique. This time there was no snow to contend with, but it was late spring during one of those elongated rainy spells which frequently overlap one another in the Juneau area. The muskeg, naturally boggy anyway, was what is probably called super-saturated in semi-scientific circles. The result was a swell case of bogging down after the bulky *Pilgrim* ceased its rolling in the landing.

Barr hailed Strong's river boat at the first opportunity and traveled back to Juneau, where he got a sturdy pair of skiis for his ship. Up river he went again with several helpers, a jack and other tools and supplies. The job of jacking up the *Pilgrim* was so much duck soup—at least the three men looked as if they had been in some sort of soup afterward. Anyway, the skiis were put on.

With the aid of a sky hook, Barr took off from the muskeg flat and within fifteen minutes was being congratulated on his swell landing in the grass near the regular Juneau field.

Though another Alaskan pilot, Bob Reeves, does this trick regularly in the mud flats near Valdez, few aviation enthusiasts — including POPULAR AVIATION readers—ever heard of skiis associated with anything else than snow.

But stick around. The next time you hear of the WPA, the PWA, the Town Council or another group in the States spending a mere million or two for an airport, just recall these versatile accomplishments of our Alaskan birdmen. In a country where many sections rely on the airplane as the *only* means of transport, niggardly appropriations are made by the federal government toward improving even the base landing fields. No wonder Alaskan flyers need a few tricks up their sleeves.

With or without skiis, Barr has used many tricks in pulling out of tight spots, but on these occasions his trips were for freight only, and he carried no passengers. Like other capable northern flyers, he knows full well that a successful pilot is a careful one.

On this route between Juneau and Atlin lies the Ice Cap, one of the most beautiful bits of aerial scenery in the world. Over this route in good weather and bad, in his several years of flying, Barr has traveled hundreds of times and never has grown tired of viewing that great sea of ice from the vantage point of his plane. The writer has traveled on several trips with Barr for photographic purposes over the Ice Cap, and agrees with him heartily.

The Ice Cap, remnant of the great ice sheet that once covered a large portion of North America, is the "Mother of southeastern Alaska's glaciers". From its thousands of square miles of area, annually replenished with heavy falls of snow, feed the beautiful rivers of ice that tourists view from decks of steamers plying the Inside Passage. Few realize the existence of the Ice Cap. Even many residents of Juneau, capitol city which nestles against the foothills of the coast range, do not realize the vastness of this area which lies back of them.

The writer's trip with Barr in his *Pilgrim* required about an hour and 15 minutes. From take-off near Juneau, the circling climb over the Gastineau channel, the exhilerating trip skirting the edge of the Ice Cap to the flight along the edge of blue Lake Atlin and the landing at the Atlin field the flight was a dozen flights rolled into one as far as scenery was concerned. Like a beautiful woman, the country's beauty won you immediately but coldly warned you to stay your distance. Incidentally, if there are any Loreleis on the Ice Cap they must live off of the

(*Continued on page 97*)

Barr took a picture of his "Moth" just after a gust turned it over in a bleak, uninhabited wilderness. Scraping up odds and ends, he repaired her and flew her home.

The FAIRCHILD "24"

"...so I took the $

by Major-General JAMES E. FECHET

Former Chief of the Army Air Corps, now retired.

I ADMIRE the American Navy. It is a wonderful organization. It *is* an organization—a tight, closely knit one. The U. S. Navy speaks with one voice. It always sounds off on any question which concerns it with the power and force and unanimity. It has a way of getting what it wants. That too, is to be envied. I admire success in any line, in any occupation, in any endeavor.

The Navy has a selection system for promotion. It is hard but wholesome. It operates to keep naval personnel on its toes; it keeps young men at the top; it gives rapid promotion and advancement; it prevents stagnation and laziness.

The Navy has always appeared to have more influence with Congress and with the people than the Army. That has been because of its centralized organization, its way of speaking with one voice, its habit of knowing what it wants and going for it in a wholehearted way.

The Navy has always taken care of its own. Example: the dependent of a Naval aviator who dies in an airplane crash gets twice the gratuity that dependents of an Army aviator get under similar circumstances.

Another admirable policy which the Navy has demonstrated is its system of building the fleet. When it asks for funds with which to build a new battleship, it asks at that time for funds for personnel to man it, for guns with which to equip it, for maintenance and operating funds—in short, for the wherewithal to make it a competent adjunct to the fleet during its lifetime. When the Army asks for funds with which to build a new post, it often gets funds to build part of it this year, another part next year, and obtains personnel and equipment with which to man it later. The Army is not so insistent for its funds complete in lump sums as is the Navy. The wisdom of the Navy policy has been demonstrated times without number.

On the other hand, when funds are cut in the Navy, it lays up a battleship, or temporarily retires from active duty some other complete component of the fleet. The Army, on the contrary, when forced to reduce its operating expenses for any period, is wont to economize over the whole establishment. It scrimps and saves and pinches in an effort to keep the whole organiztion operating, but obviously on a lower general plane of efficiency How much better it would be to render inoperative one post or station, and keep all that is left at a high plane of operating and tactical efficiency. Of course this Naval method of paring for economy is not due entirely to sharper Naval acumen. There is a political reason which has been allowed to dictate that difference in policy. No state nor congressional district feels that it owns any one battleship. On the other hand, Army posts tend to become the possessions of the cities or political districts in which they are located. Thus, if the Army followed the Navy system of cutting down on the number of posts when funds were reduced, it would have the doubtful pleasure of selecting a post to close down. When that happened, the town or congressional district whose post was to be eliminated would feel a personal affront and react accordingly. So, of political necessity, when the Army gets a cut, it spreads it all through the service, rather than to close one establishment. In this respect, the Navy en-

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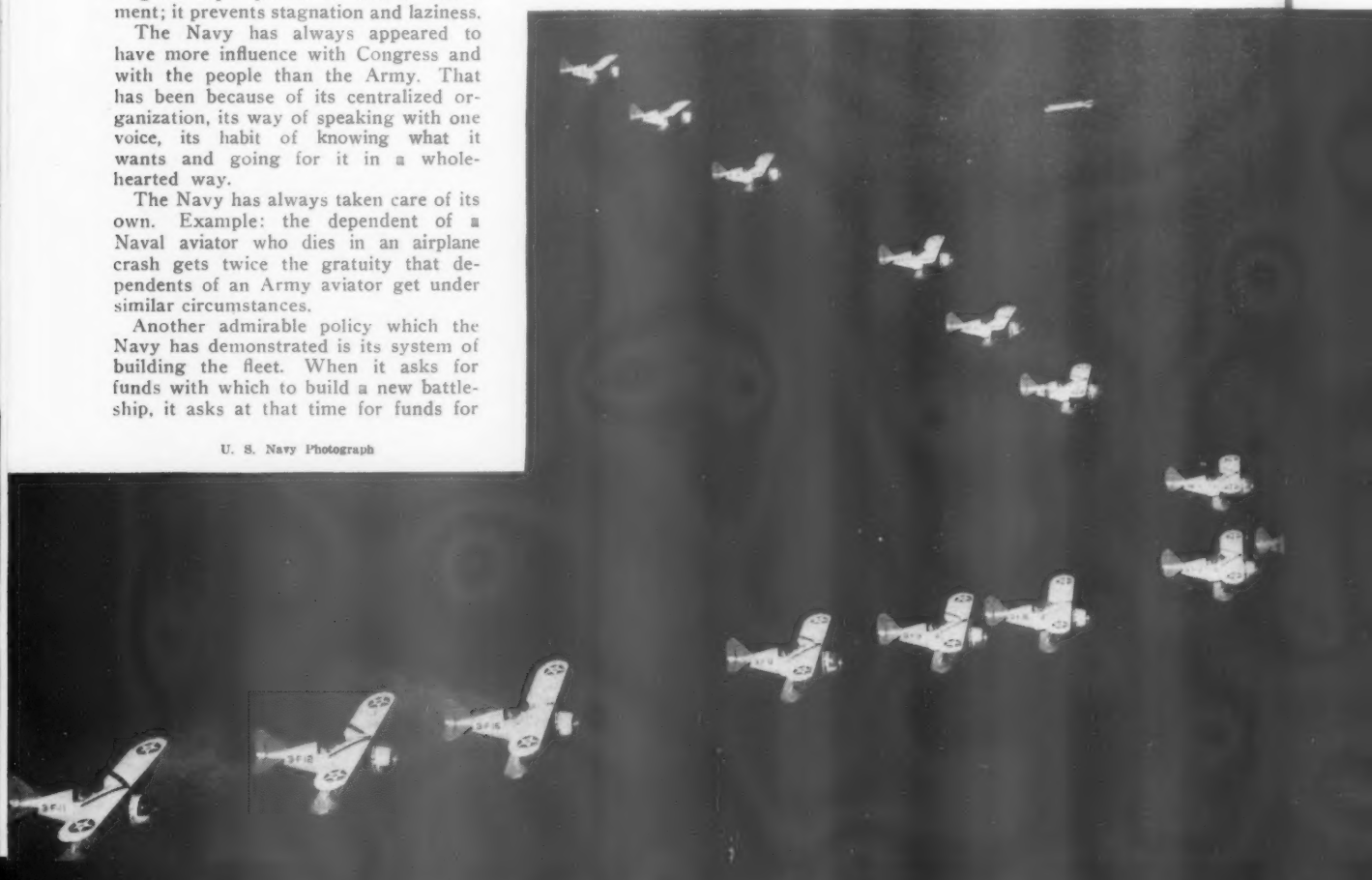
There is more than $500,000 in aircraft shown in the picture below. But compare this figure with the cost of one sea-going Naval vessel likely to be attacked by them.



U. S. Navy Photograph

$800,000,000.00"

The Navy gets a hand from an Army general. From one who knows full well that military aviation men must fight together for their branch.

joys much greater freedom, being on the water and not in any one political subdivision. But, whatever the reason, the Navy system is to be admired for its efficiency. That is the proper way to react to the dictates of reduced financial support, simply say, "Well, if that is the size of Navy you want, then you shall have it," and out goes the battleship; one, two, or more, depending upon the size of the chunk cut from Naval estimates.

Navy method, keenness and alertness never drew greater admiration from me, however, than recently. Quick to sense the tense international situation and to recognize that a Naval increase might very well be hung upon it, the admirals did not ask for a pittance, they went the whole way as is their custom. They asked for *eight hundred million dollars!* That is why I say, you have to hand the accolade to the Navy. They never do things by halves. At the same time, the Army was assigned some $17,000,000 in view of the disturbed world scene. Again the Navy scores. Ask for what you want. The worst that the givers can say is no.

The request made upon Congress for an increase by 20 per cent for the Navy has raised a storm of protest all over the country. But for more than two weeks, now, the Navy has stood its ground. It has gone before congressional committees and again with that single voice, that complete unanimity it has told its story. It has not backed down one whit. It has admitted that battleships cost money—first line battleships cost more than $60,000,000—but it has made giant effort to show that those battleships are necessary and that they are worth what they cost.

I have not always agreed with some of that testimony, but again I admire and applaud the Navy method. One admiral, in testifying about battleships, said something about it taking more than 600 planes to equal the fire power of one battleship. He arrives at that absurd figure, I assume, by taking the weight of one 16-inch shell, multiplying that by the rate of fire of one gun per minute, then by the number of guns on a ship. He comes up with an enormous figure of projectile weight for one hour's work. There are some holes in that specious argument, which even non-military minds will be quick to pick up. In the first place he knows that the whole fleet cannot carry that quantity of high explosive. He knows that if those guns fired at that rate for even a few hours they would have to be replaced, a process requiring a long time at a dry dock or shore station. He knows also, that the battleship proceeds to the point of combat at some 30 knots at best, and must journey at no better rate than that to the shore station or supply base where new stores can be loaded. He also knows that the airplane on the other hand, can ply between objective and reloading point at more than 200 m.p.h. He does not say definitely, but he leaves the inference, that one battleship is worth more than 600 airplanes. Such an argument is, of course, absurd. Nine modern bombers will prove more than a match for any one battleship under any condition at any time and place. Neither is that, however, a conclusive argument against battleship construction. Machine guns can kill soldiers, yet we still need soldiers.

As a matter of fact, the Navy itself does not believe that battleships are invincible against airplanes, despite the propaganda which has been put out to that effect. How do I know that? By this simple reasoning process. The Navy has now more than 1,000 airplanes, the authorization set up for it in the Congressional act of 1926, passed as a result of the Morrow Board report. Yet it is now planning to build, and has asked Congress for funds, for some 1,500 *more.* Among that number will be many heavy bombers. It is not buying those

Naval aviation always has been well cared for by the admirals. The view of the U.S.S. Saratoga below represents many millions of dollars in first-class aviation equipment.

U. S. Navy Photograph

bombers to attack light enemy surface craft, for heavy bombers with large bombs are not required to sink lightly armored craft. It is buying heavy bombers with which to attack enemy battleships. Now, if our Navy's heavy bombers can sink enemy battleships does it not follow that enemy bombers of similar weight and characteristics can sink our own battleships?

It has been well established for more than 20 years that the proper proportion of airplane strength between the Naval and Army aerial components is about 40-60. Out of each 100 airplanes owned by the United States national defensive forces, 40 should be in the Navy and 60 in the Army. If the Navy is permitted to build up to a strength of 2,500 airplanes which it now asks, and the Army remains at 2,320 which our Secretary of War, the Honorable Harry H. Woodring recently promised by June, 1940, our aerial defensive forces will be badly out of proportion. But for me, that reason is not controlling. I want this nation to have an adequate aerial defense. With the emphasis—the alarming emphasis—now being placed on air armament by the leading nations of the world, it behooves this country of ours to match foreign air programs. If the Army is not going to build to a figure which will assure our air frontiers security, then I am for the Navy in its effort to provide that needed aerial armament.

To my way of thinking, here is the proper line of reasoning about the present Naval program now being rapidly discussed by Congress and the country, and I have not heard this reason mentioned in all this hurly-burly:

The President of the United States is, by our governmental set-up, the Commander-in-Chief of the Army and Navy, our dual defensive establishments. I am first, last, and all the time an ardent believer that when you give an individual a job, that you give him the tools he wants with which to do that job, and also give him considerable latitude in the doing of that task. One of the poorest executive attitudes in the world, I have found after more than 30 years' experience in the Army directing men, is to give a man a job and then sit by to tell him at every step how to do it. That stifles initiative, makes for hesitancy and an all-around poor job. No man can do his best work if, while he works, he has continually to look over his shoulder to see if he is pleasing his boss. So, if the President wants a bigger Navy in order to preserve our national integrity and maintain our prestige at the peace tables, I am for giving it to him. I am for it as a private citizen, and I am wholeheartedly for it as an ex-member of the military establishment.

So, I say, a wise Congress and a wise people will give the President his 20 per cent increase for the Navy. I am not one of those pessimists who believe

(*Continued on page 78*)

Mirrored Lakes Menace Flyers

This American-built Fairchild monoplane was a victim of a "mirrored lake." This menace has been done away with by having motorboats roughen up smooth lake surfaces.

WATCHERS on the shore of Great Bear Lake saw a plane coming in for a landing. They saw it slant down at a sharp angle and waited for it to flatten out and land. Instead the plane kept in its downward flight.

The watchers gasped. That pilot was taking long chances, they told themselves. The next instant their gasps turned to shouts of horror. The plane had dived straight into the lake. Mirrored water had claimed another victim.

The pilot of that plane, Jimmy Vance, wasn't to blame. He was blinded by the reflection of the sun off the smooth, still water of the lake. He was actually flying into a huge looking glass which blinded him. If there had been a single ripple on that water, Jimmy would have seen it. But there wasn't. That is why today, motor boats are kept at all northern landing places to stir up the water if a plane is about to land.

Nor are mirrored lakes the only menace facing northern flyers. The "pink haze" of the Arctic is every bit as dangerous. Walter E. Gilbert, one of the most famous of Arctic flyers said:

"I never realized just how bad the pink haze can be until one day I was flying along the coast line and noticed that the rocks had become covered in snow. This made the earth and sky seem as one—all one single picture of pink haze. By that I mean that there was no horizon, the sky and sea, and land, all blended into a single pink blur

"I thought I had about three thousand feet and I noticed my motor was turning up rather fast. I glanced at the 'tach' and saw she was doing about eighteen fifty, too much for cruising so I glanced at my altimeter and saw I had less than five hundred feet. Believe me, I pulled out of that in a hurry. In a little while I saw a few black rocks ahead and knew I was all right."

In commenting on this, Gilbert, who knew Ben Eielson, famous Polar flyer, killed in a crash in the Arctic, said:

"I always figure that pink haze killed Eielson. He flew straight into the ground."

Thus, in addition to storms and adverse weather conditions, Arctic flyers have two more hazards to face.

But not Arctic airmen can be faced with such dangers. Airmen flying in the more heavily populated sections of the world also may find himself called upon to cope with an identical situation. At best, water is one of the most difficult objects over which an airman must judge altitude. Many a bad seaplane accident has been caused by the pilots inability to decide when to stop descending over a body of water. Let inexperienced sportsman pilots especially pay heed to the dangers involved in effecting a landing on small inland lakes that are not subjected to fairly constant breezes from some direction. Pilot have crashed under circumstances like this, some of them far from any possible aid.

This victim of a glossed-over lake was completely washed-out. Many a capable airman has been the victim of Nature's deception, caused by the sun's reflections.

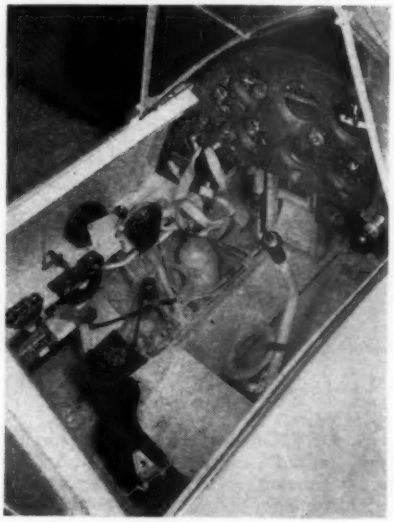
Major Al Williams (front) tries out his new Grumman. The man in the rear cockpit is Samuel F. Pryor, Jr., prominent New York businessman.

AL WILLIAMS' NEW GRUMMAN

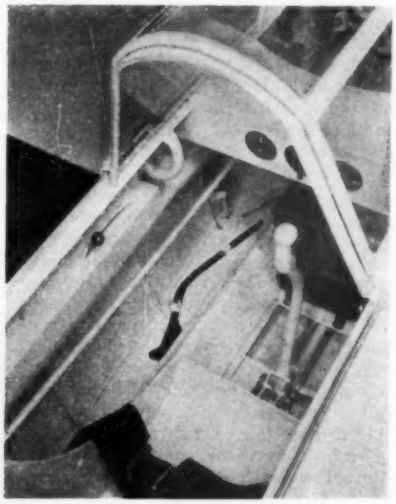
MANY an oil company has a top notch aviation division, complete with a fleet of the best airplanes money can buy. But few such companies—if any—have the aviation department Major Al Williams has built the Gulf Oil Company. Not that Gulf's aviation division isn't due almost entirely to Al Williams' efforts. It is—and the Gulf people seem pretty much aware of it.

Where that company had exactly no airplanes and little aviation business not long ago, Gulf now has a sleek up-to-date fleet of five Stinsons and Al's two Grumman fighters, both of them for his personal use. Lest the casual reader be unduly surprised at Al's purchase of a second high-performance Grumman, here are two reasons given for the purchase of the newest Grumman shown at the top of this page: (1) it will serve as a standby ship for the single-seater in connection with his nation-wide exhibition flying (he does a great deal of this around the country every year; he was in Europe putting on a show as this was being written), and (2) the second Grumman will serve as a company executive plane to facilitate his transaction of business throughout his territory. What Al likes most about the new ship, though, is that fact that it is a true fighting plane in which he can show a passenger what it feels like to fly that type of ship.

Technically, meanwhile, the newest Gulfhawk is interesting. It is fitted with a 1,000 h.p. Wright *Cyclone* engine that turns a Hamilton-Standard controllable pitch propeller. Top speed at 7,000 ft. is 280 m.p.h. Cruising speed (at 60 per cent throttle) is 210 m.p.h., and range at that speed is 700 miles. The ship has the breath-taking rate of climb of 3,800 f.p.m. and its service ceiling is 32,000 ft.

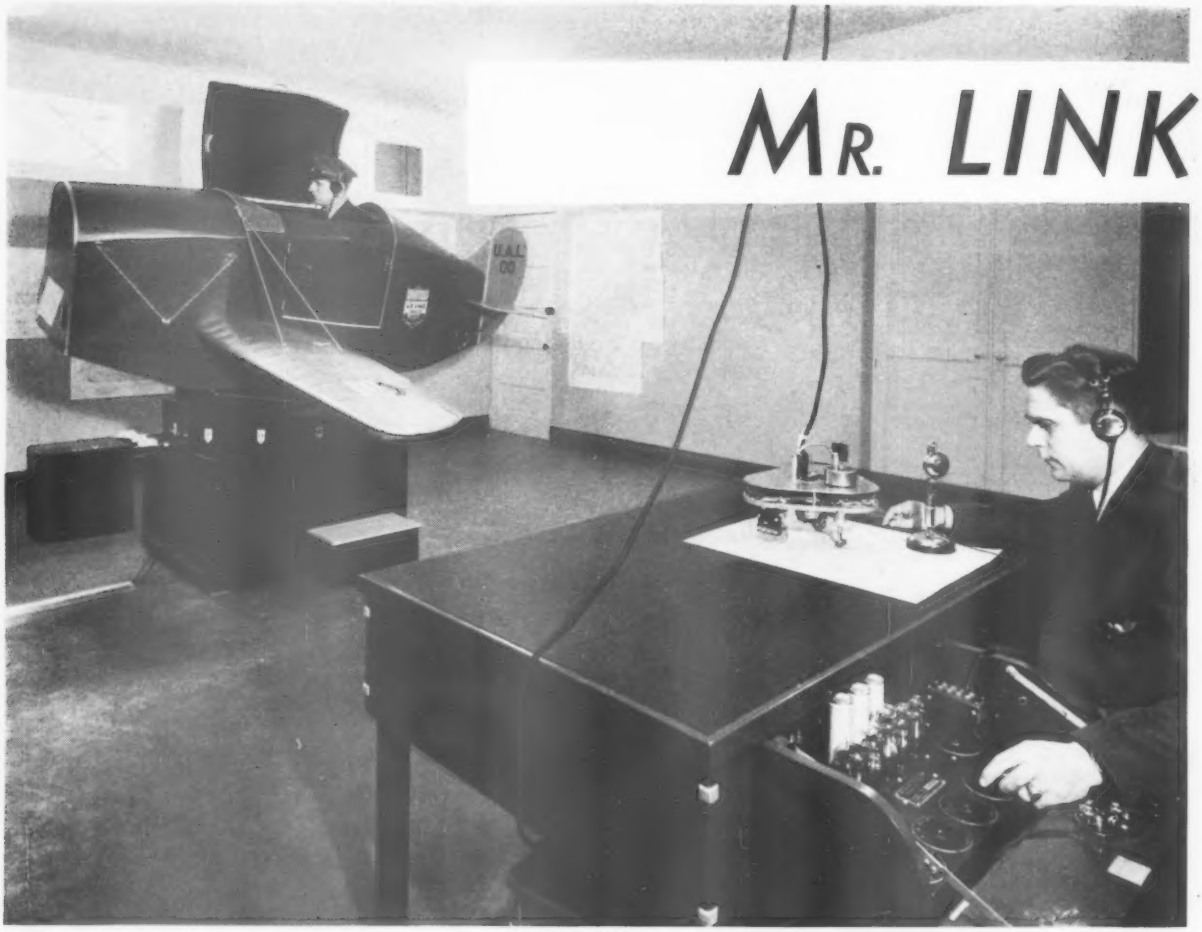


Above is the front cockpit of Williams' new Gulfhawk. The photograph below is of the rear cockpit. Note extra controls.



Below is Williams' first Grumman, the single-seater. He will keep both ships now.

MR. LINK



Far from being a carnival attraction, Edwin Link's trainer today is a serious and important part of airline instrument training.

A DEVICE that began 10 years ago as a 25 cents-a-ride carnival attraction is today winning fame and fortune for its young inventor and helping take the gamble out of aviation.

Working in his father's piano and organ factory with only two years of aviation experience in 1928, Edwin A. Link, Jr., crudely fashioned an awkward contraption designed to teach student flyers the manipulation of airplane controls. The cockpit was an attempt at a replica of those in a full size plane, with the wing, body and tail constructed in miniature, resembling a very ugly duckling.

Educated in Binghamton public schools and at the Lindsay Institute in Wheeling, W. Va., Link became interested in flying in 1926 while working with his father. Not "hepped over aviation as a kid", he took up flying "just to find out if it was really as dangerous as everyone seemed to think it was." In 1928 he barnstormed the country, opening many airports, later coming back to Binghamton with the idea of teaching prospective flyers. "Being naturally lazy" as he admits today, Link decided there must be a way of instructing embryo flyers on the ground. Then followed several months of experimentation and finally the first crude Link trainer for aviation use appeared.

After many fruitless attempts to sell the device to training schools for use in their classes, the inventor was ready to call the whole thing off. The schools, it seems, were not even slightly impressed with the trainer and could not see its benefits to them.

The same year found Link journeying to an aircraft show in St. Louis with his invention. It was here that people really began to show an interest in the contraption, but not the people who Link was seeking to interest. Manufacturers at the show failed to get excited with the device but spectators swarmed the Link display and clamored for rides, until in a desperate attempt to ward off the flood of curious bystanders, the inventor informed prospective riders that it would cost them 25 cents for spins in the queer looking craft.

If he thought that the fee would dampen interest, Mr. Link was very much mistaken. For days he spent his time boosting curious people into the cockpit, giving the craft a few whirls, and turning them out. For the most part, the customers were interested not in learning to fly but in the thrill of the novelty. The tide turned, however, when Casey Jones, then a barnstorming pilot, but now chief sales representative of the Link Aviation Devices firm, happened to inspect the display. Immediately interested, Casey later ordered several of the trainers and toured carnivals, fairs and exhibitions, soliciting riders at 25 cents per shot.

Other exhibitors placed orders with Link and the device began to make its appearance at public gatherings and resorts but still as a novelty and not as a training ship for aviators. Progress of the scheme was stymied soon after the stock crash and Link was more or less unheard of until the cancellation of the air mail.

Then, he relates, the country and the world began to realize the vast need of instrument flying. The first few trainers, sold for amusement purposes, were manufactured at a small shop set up in an old hangar at West Endicott, a few miles west of Binghamton. It was there in 1932 that he completed the first perfected job, with instruments. He then moved the plant to Cortland, N. Y., when unexpectedly he received an order for six ships from the War Department. The U. S. Navy had bought one of the earlier models in 1930 and experimented with it at Pensacola.

From the time of the U. S. Army

DIDN'T MISS

by GEORGE O'CONNOR

You've seen the Link trainer, but have you met Mr. Link?

Edwin Link "took up flying just to find out how dangerous it actually was . . ."

order, things began to pick up. Small orders began coming in from different parts of the globe and after attempting to fill them at the Cortland plant, Link returned to Binghamton and set up a factory in 1935. A second plant at Gananoque, Canada was established less than a year ago.

The two plants are now humming with activity with more than a year's work ahead of them. Sixty trained men are employed in the Binghamton plant and 75 more working at top speed in the Canadian unit.

Link has sold trainers to practically every country in the world, including all large powers and most of the smaller ones. Uncle Sam, strangely enough, is a comparatively little customer, Link reports, and is now using only 35 completed machines.

Gross business last year totalled between $500,000 and $600,000. He has delivered more than $250,000 worth of the trainers to Great Britain and recently started another order totalling approximately $1,250,000.

A year ago February, Link was invited to Japan as guest of the government and travelled there for several months teaching the use of the trainer. He also visited China. As a result of the trip, he received $500,000 in orders, of which Japan submitted the greater part. It is a quiet week these days when some emissary of a foreign government doesn't drop in at the Binghamton or Gananoque plant to inspect the device and place an order.

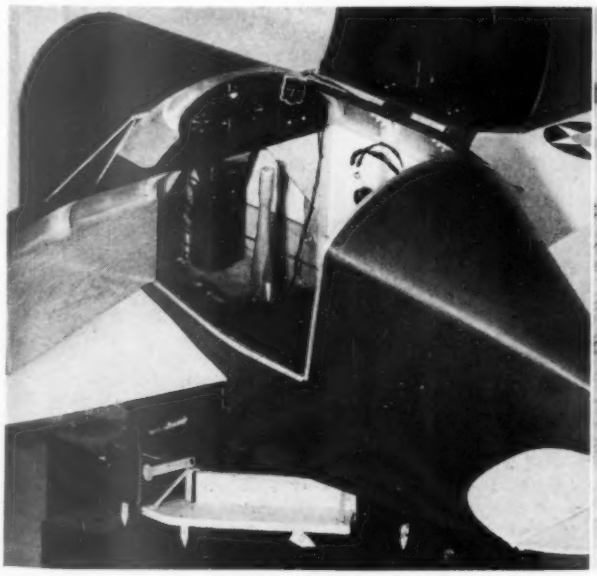
The trainer today is a far cry from the first crude model that was born in the piano and organ factory. Carrying almost every modern aviation device known to man, it has an exact replica of the standard cockpit. It is not in reality a device in which students may learn to fly, despite stories to the contrary. Primarily it is designed to teach transport pilots how to fly, take off and land *blind*. It would be impossible for a layman to hop into the ship a few times and emerge as a pilot, Mr. Link declared.

"I do feel safe in saying that with the new inventions and instruments now being perfected, within a short time air transportation will be regarded as the safest mode of travel", he states, in commenting on the advancements being made through the use of blind flying.

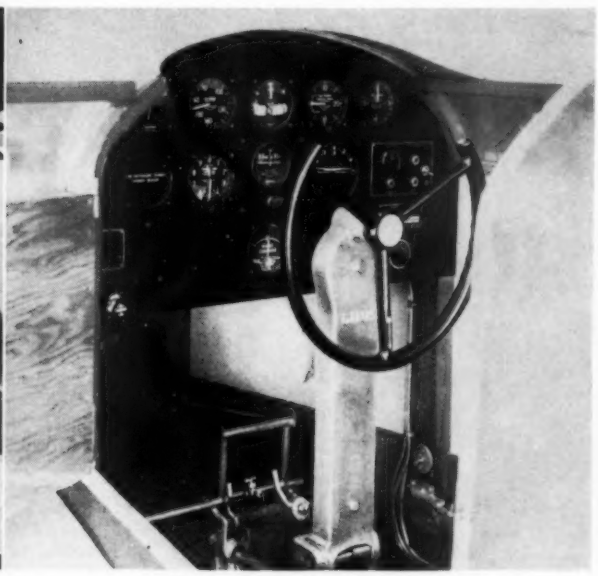
The device is purely an aviator's training ship in which pilots may perfect flying without ever leaving the ground. The cockpit is regular sized and carries full equipment. The one wing, body and tail assembly are in miniature but to a scale where their workings are as accurate and dependable as in a full size man-made bird. It is the only official instrument training plane of the U. S. Army, Navy and Department of Commerce.

Mounted on a standard base, the trainer is connected by cable with a table and set of recording and set of recoding dials nearby. The instructor takes his place at the table and the flight is ready to start. The instrument dials record each and every movement of the ship from the time the "flight" starts through the "landing". The student is guided by radio beam as in a regular flight. The beam directs the pilot to port and the instruments record the exact distance from the ground at which the trip was made and the amount of clear space. It is so perfected that it is possible to seal the student in the cockpit and have him take off, fly and land absolutely blind at all times.

The Link trainer is in standard use by the Army Air Corps at its flying schools. Compare this Army Link with that at right.



Far more elaborate, and equipped with an airliner's "dep" control, is an airline Link. Note the many blind-flying instruments.



The trainer is equipped with a device to simulate all types of weather, good and bad, that might be encountered on an ordinary trip. A simple twist of the dial at the instructor's control table brings a ready-made thunderstorm, a windstorm or rain. Likewise, good flying conditions may be simulated. In the demonstration, the student is tried out in a smooth air strata, then over the "bumps" and thirdly in violent conditions attendant in a windstorm or thunderstorm.

The ship performs as if it were actually in the air, accelerates to speed, tips, glides, spins, dips, circles and glides according to the skill of the operator. A series of bellows type air-filled devices react to the control stick and simulate actual flying. All materials used in construction are of the finest grade available. With the hood of the cockpit in place, it is impossible to find any structural differences between the trainer and the real thing. All dials are in a concentrated space less than eight inches square. A new optical device groups all dials so that even the faintest flicker can be instantly detected. In addition the ship is equipped with either a stick or wheel, according to the type of plane which the student is going to fly.

The individual trainers can be modeled after all types of ships from the heaviest bombers down the line.

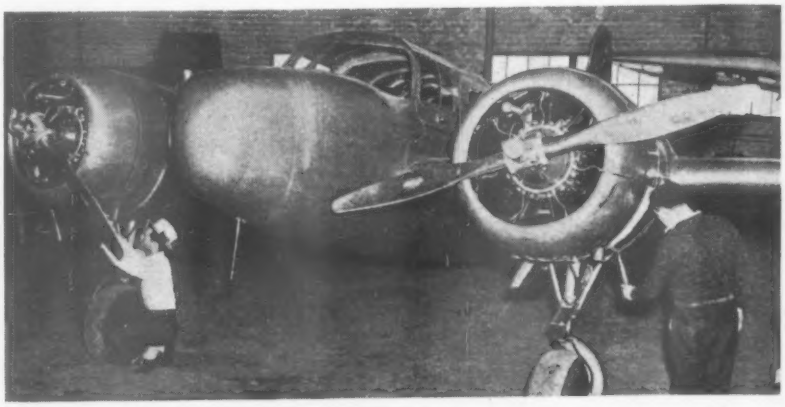
Link now is working on a highly perfected model which will operate automatically and without the assistance of an instructor. In addition to the trainer itself, he is also experimenting with other aviation devices.

Link, the 34-year-old pilot, inventor and businessman today holds all types of licenses and is graded to fly anything from the smallest pleasure plane to the hugest multi-motored jobs on the commercial lines. He doesn't find time for

(*Continued on page 72*)

There's little difference between Link's busy plants and a humming plane factory.

Vance Breese's All-Wood Transport



The Breese ship is "a figurative nose-thumbing to the giant metal-clad monsters of today." The construction process, however, follows standard all-metal practice closely.

"WE are to be different sems to be the batle-cry of a score or more aircraft designers and builders who are to-day turning their backs on supposedly "up-to-date" trends in aeronautical engineering.

In the face of the army of modern, all-metal, streamlined designs that course the nation's airways daily, a gentle but firm group of "radicals" have crept into the industry, a group that has pinched its nose and waved its hand at our "modern" methods and have reached into the presumably "dead" past of aviation and unearthed several sound details of technique that hold such promise that their clan is increasing daily.

The pusher, the tricycle landing gear, and now all-wooden construction are marching on the stage with cold hard cash to back them up and practical proven designs on which to work. And the latest of these is the Breese transport-bomber, which has just been trundled from its West Coast factory for the first time.

Of wooden construction throughout, a figurative nose thumbing to our giant, metal-clad monsters of today, the ship is an eight-place, twin-engined monoplane designed for use as a passenger transport or to be quickly converted into a bomber. The ship is of conventional design, the twin Jacobs L-5, 300 h.p., seven-cylinder, air-cooled, radial engines being mounted close inboard. Construction follows all-metal practice rather closely, the fuselage being built up of processed plywood nailed and glued to formers.

No longitudinal members are employed, the stress being carried entirely by the wooden skin. The tail surfaces are of wood cantilever design employing a single vertical rudder. Only the full N.A.C.A. engine cowlings and the fittings for the retractable landing gears which fold to the rear and up into the engine nacelles are of metal.

The craft weighs only two tons empty as compared with the three tons of similar all-metal designs. Gross weight with six passengers and the crew of two is less than 7,000 pounds. As a bomber, a crew of three is employed and the remaining weight-space is occupied by the bomb load, machine-guns, implacements and accessories.

The wooden monospar cantilever wing measures 48-feet from tip to tip and the craft stretches only 30-feet from nose to tail. It is nine and a half feet high.

"We are hoping that the light weight of this craft plus the economy in construction will make a hit in aviation markets the world over," states Vance Breese, one of the nation's ranking test pilots and vice-president of the company. "Its interchangeability from passenger plane to cargo transport to bombing plane should appeal to not only South American markets but to nations throughout the world who have been searching for just such a ship," he continued.

The craft was put through its paces for the first time under the expert hand of the veteran test pilot. The success of subsequent speed and maneuverability tests has been reflected in his smiling eyes and praising tongue. Performance figures show a top speed of 210 m.p.h. and a cruising speed of 185 m.p.h.

Aruthur Mankey, former chief draughtsman for the Northrop and Ryan concerns is chief engineer for the new company. He states: "The ship will sell for around $35,000 which is considerably less than the $50,000 price demanded for metal planes in the same class."

Hawley Bowlus, famed glider manufacturer and enthusiast, is Plant Superintendent and his experience with wooden construction and lightness of design as shown in his record-breaking gliders had contributed largely to the success of the new plane.

Frank W. Bennett, millionaire Texas oil financier, is backing the venture. The plant is located in Van Nuys, Los Angeles County, California.

Its lightness of construction contributes to ease of handling in the air and to convertibility from a speedy and comfortable passenger transport to a deadly bombing craft.

"Leigh and his radium ship" are famed up in the wild Northwest Territory.

RADIUM EXPRESS

by EDWARD GREEN

This is the story of an airplane and man, both of which are worth their weight—literally—in gold. All because of a pair of sharp eyes.

THE penetrating drone of an airplane motor shattered the stillness of the sub-Arctic terrain at Great Bear Lake, Northwest Territories. At the controls of the plane sat W. Leigh Brintnell, president and general manager of the Mackenzie Air Services. He was on his way back to Edmonton Alberta after a trip to Aklavik in the Western Arctic.

Brintnell's keen eyes scanned the barren country below. If anyone had told him then that soon there would be a thriving industry on the shores of Echo Bay on Great Bear Lake he would have laughed at them. Had they said that the world's richest radium mine lay below his speeding wings he would most likely have advised them to see a psychiatrist and if they had gone further and said the greatest mine the world has ever known was down there it is probable he would have fainted.

Suddenly he tensed. He fixed his gaze on a peculiar colored formation in the barren rock that sloped down to Echo Bay. It was greenish in color, indicating metallic ores lay somewhere in its bulk. Down the center of the rock was another colored streak. Brintnell marked the location on his map and determined to mention it to one of Canada's greatest prospectors, Gilbert Labine.

The following spring Labine, accompanied by Charlie Paul, another veteran mineral scout, were landed at Richardson Island in Great Bear. The entire district lay beneath a blanket of snow, but this did not deter them.

Bad luck dogged them, however. The tell-tale streaks were hidden and in addition to this, Paul became snow-blind. Day after day he was kept in his tent while Labine poulticed his eyes with hot tea leaves. During one of these sessions, Labine said that he would go outside later and take a look around. If he found nothing they would return to Edmonton. On leaving the tent, Labine turned the long rocky point and came upon the ore. A hasty examination proved it to be pitchblende, a radioactive ore.

Tests proved that the pitcheblende of Echo Bay was not only plentiful, but it was also far richer than the celebrated deposits in the Belgian Congo. In other words, Brintnell's sharp eyes had made Canada and the United States independent of other nations for radium ore.

Brintnell's big Bellanca "Airbus" was built so as to be able to carry anything from precious ore to furnace boilers. The men at left are loading parts for the mine.

The tiny settlement below doesn't look as though it produces a fortune in precious ore every year. Those barren-looking rocks actually cover the famed Eldorado mines.

Brintnell's "Eldorado Radium Silver Express" is Echo Bay's lone connection with the outside world. On most trips "out", she carries $20,000 worth of concentrates.

But Echo Bay is 1,420 miles north of Edmonton, the nearest city. A fast transportation service must be developed to serve the new strike. Brintnell solved that problem by bringing a huge green and gold Bellanca freighter from the factory at New Castle, Delaware. It was promptly christened "The Eldorado Radium Express".

It is exactly that. There are no frills and furbelows attached to freighting supplies in and concentrated ore out of Great Bear. Senior Pilot Marlowe Kennedy of the Mackenzie Air Services makes his regular run to Echo Bay on a set schedule. More than one lone prospector glances skyward to see a droning dot a mile and a quarter over his head.

"Leigh's radium ship," is his comment.

That is what the big Bellanca is known as in the north. She's Leigh's radium ship because whenever she drops in at Echo Bay on her southbound trip she picks up $20,000 worth of radium concentrates from the Eldorado mines.

But the Eldorado isn't the only rich producer Leigh Brintnell has helped bring into being. In 1928 he flew Bobby Cockeram, a famous prospector, with such success that Cockeram immediately formed his own company known as "Prospectors Airways, Ltd.," which was responsible for bringing in several paying properties.

During this year the famous Howey Mine at Red Lake, Ontario, was opened up. Brintnell was in charge of aviation operations around Sioux Lookout for Western Canada Airways, Ltd., and his indefatigable efforts resulted in the Howey Mine going into the ranks of Canada's big gold producers many months before it would have been possible by any other means. If freight could be gotten into an airplane, Brintnell would fly it. If it couldn't be gotten in, Brintnell took it apart until it could. Officials of the Howey Mine unhesitatingly give Leigh Brintnell the credit for bringing their property into production.

Brintnell first broke into the aviation game during the Great War. He was a cadet at Deseronto, Ontario. He soon learned the ropes and he was made an instructor. On his first week as an instructor a cadet turned his crate upside down and glided to earth—and a speedy decapitation. Brintnell saw this stunt would damage the morale of his pupils. He stated it was possible to fly upside down and still come out of it alive. He took a ship up and showed them.

After the Red Lake Mine was brought into production, Brintnell felt the urge to go places and do things. He flew all over Northern Ontario in the unending quest for minerals and did a routine

(*Continued on page* 91)

There's enough precious concentrates in that heap below to make almost any man comfortably secure for several years. Winter and summer, Brintnell (left) works hard.

Super Airmen?

THERE will be a corps of "super-pilots" in the Royal Air Force—if things work out as planned, that is.

British air officials are convinced that they will need super-pilots to fly the ultra-modern 400 m.p.h. fighting planes now being conceived for the future Royal Air Force. According to POPULAR AVIATION's British correspondent, this corps already is being planned on.

The theory behind the plan is based on the fact that Britain's high-speed warplanes demand the pilots assigned to them be 100 percent efficient, both physically and mentally, as the safe control and operation of an airplane flying seven miles per minute demands reactions measured in fractions of seconds.

As now planned, young men between the ages of 18 and 25 years of age are to be carefully selected for the highly specialized training. As yet, doctors and psychologists are not yet quite certain whether or not a human can stand up under the physical and mental strain over a long period of time. Movement at such high speeds can cause a temporary "blanking out" or unconsciousness on the part of a pilot. Also, the changes in bodily weight occasioned by variations in speed while flying so fast may, in certain circumstances, cause serious internal injuries. With this in mind, then, R. A. F. medical men intend making it compulsory for the super-pilots to wear a specially design "corset."

Another problem is whether, by means of certain nerve exercises, the pilot's reaction time can be improved. Thus messages which travel, for instance, from the eye to the brain and thence to the hand may, after certain training, cover this same path in a shorter period of time than in a normal person.

Develop New Lens

AFTER extensive testing by Air Corpsmen at Wright Field, Dayton, Ohio, a new anti-glare lens, designed to absorb all radiant energy which does not contribute to vision and to transmit the radiations by which details are seen, has been announced by the Bausch & Lomb optical company.

Developed primarily for flyers to relieve eyestrain induced by the intense illumination in the upper atmosphere, the new lens is made of a dense new optical glass of a soothing green shade. The lens is opaque to the harmful radiations of ultra-violet and infra-red, but completely transparent to the yellow and yellow-green radiations.

In describing the new lens and the principle behind it, Bausch & Lomb experts wrote POPULAR AVIATION:

"Under conditions of ample illumination the eye is most sensitive to yellow and yellow-green. Under dim illumination, the eye is sensitive to green."

There are many colored lenses on the market, but nearly all of them distort colors.

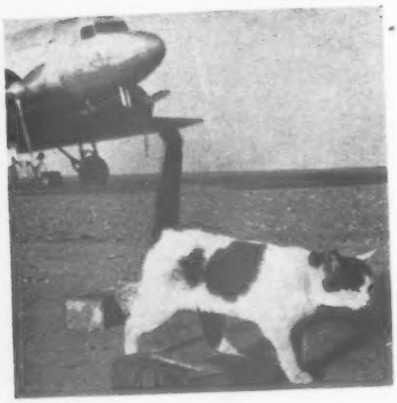
GOB FIGHTER

Uncle Sam's Navy has earmarked $1,910,395.20 for a sizeable batch of Brewster F2A-1 fighters like the above.

Taking the fastest possible means of getting home, these four Polish airmen flew a new Lockheed from Burbank, Cal., to Poland.

Former President Herbert Hoover recently made his first trip on a regular airline. Hostess G. L. Marvin said "he liked it".

Personalities



This smacks slightly of airline ballyhoo, but TWA men at Amarillo, Texas, insist Rachel the Cat only goes out to meet TWA ships and no others. Helium the Dog, meanwhile, is air-brained. He's helped land blimps at Miami 3,000 times.

The Taylor-Young airplane company conducted a beauty contest recently and ended up with Miss Dorothy Ayers as "Miss Taylorcraft".

Dr. Margaret Chung has a son flying in China, founded the "Fair-Haired Pilots".

New head of Imperial Airways' Burmuda operations is Capt. Griffith James Powell.

Capt. William A. Winston, veteran Pan American pilot, is a confirmed model builder.

Clarence Chamberlain, the trans-Atlantic flyer, gulped recently when "Baby Lillian", circus fat lady, waddled up for a sightseeing flight. She got it.

Flying Officer A. E. Clouston, British ace, broke the London-New Zealand record, got a kiss from the Missus.

The five Air Ministry officials below were largely responsible for England buying 400 American planes.

Some Pilots Get All the Breaks!

by FRANK LAMBERT

This is the story of poor old Charley. He is a swell pilot but Lordy, what luck he has! It's said, though, that his long streak of mishaps has let up a bit lately. We hope so.

YOU can't blame the old-time pilots for being superstitious. Things were always happening to them; unpredictable things over which they had no control. The events of flying today are far more controllable and predictable than in the old days when experiments were performed in the air instead of in wind tunnels . Science is leaving less and less to chance and thereby destroying the opportunity for superstition. But there is a fellow still flying, not exactly an old-timer and not particularly superstitious, who would nevertheless have as much right to a rabbit's foot as any of them.

Over the brief period of five years during which I was in close contact with Charley Martin he was the victim of more aeronautical mishaps than some of the old-timers encountered in a lifetime. (In fact, in the old days he would have been dead more than once, for he has saved his life on two occasions by using a parachute.) And if there was any half-dozen pilots whose total of misfortunes during that period could have equaled Charley's, each one of them must have considered himself very unlucky.

No doubt you are thinking that Charley himself must have been largely to blame, but you are wrong. I flew with Charley frequently and at other times observed his work very closely but I could never find anything to criticize. He was a more experienced and a better pilot than I was and we were doing almost exactly the same work with the same planes, yet almost everything happened to Charley. Or perhaps it would be more accurate to say that things happened to the planes almost exclusively when Charley was flying them.

You might argue that he was really lucky to be able to get himself out of difficulty so often, for that was what he did. But I am inclined to give Charley himself most of the credit for pulling through so many times without serious consequences. Certainly he was an honor graduate from the school of experience in emergencies. But how could a man be so unlucky as to get into so much trouble in the first place? I don't know. I can only relate to you some of Charley's most amusing experiences and let someone wiser than Charley or myself figure out why they all had to happen to him.

In common with the majority of experienced pilots today, Charley began his career in the Army flying schools. He was almost ready for graduation at Kelly Field when fate began to take a hand in his affairs and the very first thing that happened was enough to last a man a lifetime. Flying back from El Paso across a particularly rugged and desolate region near the Mexican border his motor threw a rod and enveloped the plane with choking smoke. Charley lost no time in piling over the side. Of course the parachute opened, or his streak of bad luck would have ended a few seconds after it began. But he had scarcely stopped swinging when the strong wind slapped him against a rocky hillside and dragged him some distance before the chute collapsed. Circling overhead in another P-1 was another student of the pursuit section who had been following close behind. Charley knew him well. He was a playful fellow, a brilliant student and a skillful pilot, but he was a man who did not know the meaning or the wisdom of fear. As Charley sat on the hillside nursing an injured knee his friend circled and dived overhead in an effort to attract the attention of any possible rescuers. He dived lower and lower into the little valley until Charley began to worry about him, and with good reason. Finally a sudden gust of wind down the valley caught the plane in a steep bank and slapped it against the hillside on which Charley was sitting.

"Instructor, does my parachute show?"

Charley heard his friend yell as the plane struck. He managed to limp to the wreckage but he might as well have stayed where he was, for Death had struck with the plane. Charley limped away.

"Things were happening too fast for me," he explains. "It was worse than being all by myself. After a while some people came and took us away, but there was nothing for me to do while I was waiting for somebody to show up. I couldn't even light a cigarette, because I didn't use them."

After that, Charley took up smoking. He was not seriously hurt and was able to finish with the rest of his class, but it was some time before he could wear his new and expensive dress boots. And that was quite embarrassing, for those were the days when Air Corps officers were required, on dress occasions, to be shod like cavalrymen.

A few months later Charley made his first flight in a Sikorsky amphibian of the old type with an overhead stabilizer control. As soon as he left the ground he could tell that the stabilizer setting would have to be changed to fit the load he was carrying, since the plane was extremely nose-heavy. In trying to correct, he did what most pilots do with an awkward control of that type when they haven't time to look up and examine the markings—he wound it the wrong way.

Of course, when the nose dropped more stubbornly than ever Charley knew what was wrong and he tried to wind the stabilizer back in the proper direction, but in this case it couldn't be done. The crank had jammed. The plane dived for the ground and Charley had to grab the wheel with both hands to keep it from ploughing through some power lines. The elevators would just about balance the stabilizer while he pulled back on the wheel with all the force of two good arms, and the plane could not rise. For a few moments it continued to teeter along in an uncertain manner just above a complicated section of California's marvelous power system. Finally, by using his head and his legs, Charley managed to get his stabilizer and his blood pressure back to normal. He says that unspectacular little incident was his closest call but I think he was scared because of his inexperience. A little thing like that would hardly frighten him now.

Those were days of uncertainty for everybody and Charley was no exception. He was just too late for a chance at a commission in the regular army, and just in time for the pay cut and the reduction in active duty for Reserve officers, but he got another job and kept on flying. Late one afternoon he was herding an

(*Continued on page* 92)

"I just played around up there", is the way King told of a record-breaking flight.

"The Department of Commerce contended that these light seaplanes were not very practical or of much use." Ben King disproved that in the tiny Aeronca shown above.

HE SHOWED 'EM

by S. R. WINTERS

One wouldn't think there were many records to go after with a stuttering little lightplane. Ben King found some.

TWO years ago, without ballyhoo or flag-flying, Ben King took off from Long Beach, L. I., in a light seaplane and quietly proceeded to smash an international airline distance record. Since then he had been popping them off with the apparent ease of an expert marksman dropping clay pigeons until he had five.

All King's records have been captured in light seaplanes of the first, second, third and fourth categories. Asked why he had concentrated his attention on this type of plane, he replied mildly, "I wanted to prove something. The Department of Commerce contended that these light seaplanes are not very practical or of much use. I think they are."

His first record-breaking flight certainly exploded in a thorough manner the existing official estimate of what these small planes could do. He flew a distance of 185.4 miles from Long Beach to Whitney's Landing on the Severn River, using a small Aeronca seaplane with only a 35 h.p. engine, weighing about 600 pounds. This flight not only broke the airline distance record for light seaplanes in the first category (multi-seaters weighing less than 680 kilograms or 1,499.128 pounds), which had been held by the French aviators Lallouette and Albert since 1931, but exceeded their record by over a hundred miles.

Furthermore, by this same flight, King established a second and entirely new record for light seaplanes in the third category. This was possible because his plane was so light that it was also eligible under this lighter classification.

Nine days later, he took off again from Port Washington, this time in a different type of light seaplane, a single-seater weighing less than 1,256 pounds which is officially listed as second category. In a flight of 221.1 miles, another international record was smashed.

Ben King tells about these flights in much the same tone of voice he might use in saying, "I took a train for Chicago. Yes, we had a good trip. No delays or trouble of any sort. I did my business and came home." This is apparently the attitude he would like to encourage toward aviation—solid, dependable, matter-of-fact. This doesn't mean that he fails to grasp the grandeur—even the romance,'of a sturdy ship flying into the clouds. Far from it! But he would prefer a new record based on reasonably conservative planning and expectation to a spectacular stunt that was successful because of daring and a large percentage of luck. His eyes did sparkle a bit, however, when he told of his recent successful attempt to capture the altitude mark.

On September 24, 1935, he took off from the Anacostia Naval air station in the tiniest aircraft of its type listed in America—an Aeronca seaplane weighing only 524.5 pounds, and carrying only seven gallons of gasoline. King took his time and enjoyed it. "I just played around up there," is his own way of expressing it. After about an hour, his altimeter registered 16,000 feet and the plane was still climbing. Black spots appeared suddenly before his eyes and he became conscious of an alarming feeling of weakness. He tried to climb a bit more, certain that the plane hadn't reached its ceiling, but the weakness turned into dizziness and breathing became increasingly difficult. Having no oxygen with him, he was forced down.

When the Bureau of Standards studied the barograph, which had been placed in his plane to calibrate the maximum altitude, King was officially credited with an altitude mark of 15,082 feet. This exceeded by 3,728 feet the previous mark, which had been held since 1930 by the French aviator Vercruysse.

(*Continued on page* 74)

Ben King saw more than just a "Sunday-afternoon plane" in his little Aeronca.

This Panagra DC-2 makes scheduled trips over some of the toughest flying country on earth.

PERUVIAN

by FREDRIK DeCOSTE

It was a hardy, daring airman who pioneered the first commercial airplane service in towering little Peru.

WHERE hardy Indian couriers once ran arduous relays to bring fresh sea foods from the Pacific over the Andes mountains to the court of Incas in Cuzco; where in a later day black-bearded Conquistadores struggled for days up bewildering unknown heights toward a whispered El Dorado, modern transports now soar with thundering ease. And the humble descendants of a once proud civilization peer upward between the cracks of their isolated adobe huts and wonder what manner of spirit bird it is that flies so fast without flapping its wings.

And down in the sweltering heat of the Amazon jungle the hermit planter awaits the distant hum of the Iquitos plane, as the only reminder of the outside world to pass his lonely *chacra*.

Today scheduled air routes cover the major portion of Peru's three geographical zones: coast, sierra and montaña. They bridge more than one region still marked on the map as *inexplorado*.

In order to fully appreciate the immense value of aviation to Peru, one must have a mental picture of the topography of this west coast country. Coming down the coast by ship one sees no more than an apparently endless line of barren sandstone cliffs, and a desert stretching back inland, from whence a massive wall of mountain is made to seem even more gigantic in the purple haze of distance.

The boat may anchor off any of a dozen coastal towns, perched at the base of sandhills on the ocean's edge as though they had been blown there in a piece from some civilized center far away. Except for some 30-odd oases which mark the course of mountain streams this desert claims the entire Peruvian littoral. It varies in width from 20 to 40 miles, and is occasionally interrupted by small spurs of the Andes which amble toward the sea.

The foothills of the Andes, or *Quebrada*, form a barren region of broken hills and gulches in an advanced state of erosion. They rise abruptly into the sharply crested ridges of the *sierra*, from 5,000 to 12,000 feet. Above this height is the *puna*, consisting of frigid, treeless altitudes merging into peaks all the way up to 22,000 feet. This is the eastern cordillera. The western cordillera slopes down to the Amazon jungle. Between the two are hundreds of rich green valleys, in which the future wealth of Peru shall some day be realized.

Sweating men must literally hack Peru's airports out of jungle and mountain.

Roughly speaking, then, Peru is a three-in-one combination: desert coast, from 200 to 400 feet; high sierra valley region; and the semi-tropical montaña region, occupying the eastern slopes of the Andes and extending to the low basins of the Amazon river and its tributary systems. The relation of all three to aviation will be considered presently.

Following is a brief summary of the airlines now serving Peru, and the types of equipment in use:

Pan-American Grace Airways. Division of PAA. Operates international service, bringing Peru within 2½ days of New York and 2 of Buenos Aires. Douglas DC-2's and DC-3's.

Aerovias Peruanas. Division of Panagra. Operates along coast, with frequent freight charter work in the mountains. Tri-motored Fords. *(This line recently was taken over by the Faucett company—The Editors)*

WINGS

Condor Peruana de Aviacion. Peruvian company under American management. Operates two services from Lima; one to Cuzco and Maldonado, and one northeast to Iquitos. Also considerable freight charter work. Curtiss *Condors.*

Faucett Aviation Company. Operates along entire coast with many stops. Peruvian company under American management. Makes its own planes in an excellent factory in Lima. They are modeled on the Stinson *Detroiter.* One of these Peruvian-constructed planes was flown nonstop from Lima to Buenos Aires by Commander Reveredo, ace of the Peruvian Flying Corps.

The National Air Line. Government owned and operated. Serves the Peruvian orient from San Ramon to Iquitos. Travelairs and four-passenger Boeings.

As may be imagined from the highly diversified topography, Peru has a first-class variety of weather. The climate of the arid coastal belt is tempered by the frigid Humboldt current flowing up from the Antarctic. From June to November, prevailing winds blowing landward across this current are stopped by the mountains, causing re-evaporation of moisture laden fog clouds over the heated sands. During this the winter season, the pilot seldom sees the spacious airport on the outskirts of Lima, or the city itself, until he mushes down through this fog. Ceilings vary from 2,000 ft. to zero-zero.

At 4,000 ft. the sky is clear as a bell and the plane's shadow glides over a continuous bed of soapsud clouds.

This Curtiss Condor airliner, retired from service on U. S. airlines, now flies the far more hazardous routes in Peru. This ship had just left Cajamerca for Iquitos.

Stuck in the mud of one of Peru's many improvised landing fields, this Condor found many willing hands among the air-minded natives of Huamachucho to push her clear.

Believe it or not, that's an airport (below) in that little groove in the mountains! This is the Lake Piaz field into which hundreds of tons of mining freight are flown.

Instruments, radio, and an occasional hole keep pilots from coming down in the wrong place. It is often possible to lose altitude over the ocean and peek in under the curtain for a bearing. That eliminates the necessity of coming down blind and the possibility of denting the top of a high *cerro*. There is no night flying at any season. During the dreary months of mist it is considered smart to regulate schedules that don't run too near the twilight hour, because in Peru there isn't any.

Though there are few emergency landing fields as yet along the coast, there are many stretches firm enough for landings. In the summer season it is pleasant to cruise along the coast, looking out over the Pacific to westward, and at the immense mountain wall to the east. The shore below is a ragged line of cliffs, with no life other than countless guano birds. These may frequently be seen in masses a mile in diameter, spread out on the sea like gigantic black nets.

The eventual monotony of sand and sea is relieved by refreshing glimpses of sugar-cane and cotton plantations, geometrically arranged. These consume every irrigated cupful of water from streams that once managed to reach the Pacific. Outlines of towns that were centers of pre-Inca civilizations are visible among the desert hills.

Although it takes eight hours to top the eastern cordillera via the famous Ferrocarril Central from Lima, actual flight time is less than 30 minutes. This amazing abruptness of mountain wall necessitates a climb too rapid for passenger comfort, if made direct. Wherever possible, valleys are followed, especially on the up-trip. Returning from the sierra as, for example, from Huancayo to Lima, the takeoff is at 10,690 ft., and the climb over the ridge about 16,000. In skyline flight the pilot finds himself over Lima in less than an hour, with a lot of altitude to lose. It's like jumping over a fence at the edge of a cliff.

Usually, the pilot has opportunity to study the mountain skyline while gaining altitude over the coast. Severe storms are evident in the dirty appearance of the cloud mass. Birdwalking weather, and no place for a self-respecting plane. The writer has flown the Condor run from Lima to Cuzco, with a veteran pilot who formerly flew the Rockies for United Air Lines. Once when wind, hail, and hell was tossing up around at 17,500 ft. over the Ausangate range, I asked him how the Andes compared with mountain flying in the United States.

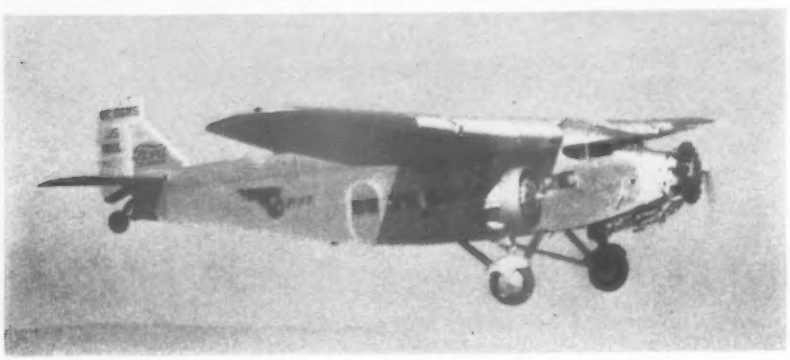
"Son", he said, "that was sissy flying compared to this run. I don't believe there's a tougher flight anywhere in the world than this blankety-blank No-Man's Land!"

He had to shout into my ear against the machine-gun patter of hailstones on the cockpit windows. The highest peak he had known before was Mt. Whitney, at 14,501 ft. Below us at the moment we could catch a glimpse of a mountain lake, nestled between peaks at that altitude, while to the southeast Mt. Ausangate rose 22,221 ft., into clouds piled higher than heaven.

Along the highest ranges, bad weather starts piling up about noon. By three o'clock you'd better know your Peruvian Andes like a book before taking off to cross them. And you'd better have plenty of fuel. A pilot may make two or three trips, and think he's got the good and bad weather passes down pat, only to find on the fourth trip that they'd all exchanged virtues. A valley that is clear for a month steady may suddenly become an *infiernillo* (little hell to you).

These, however, are the worst aspects of sierra flying. The casual air traveler in the Andes will probably not see much bad weather. He won't ever forget the silent majesty of seemingly endless miles of snowcapped ranges, the warm green glow of hidden valleys, the brilliant green or blue of mountain lakes sparkling like jewels dropped from a giant's purse. He will long remember the sight of Indian terraces clinging to dizzy slopes; llamas grazing on the brow of age-worn crests; the primitive harvesting of wheat, wherein horses are driven around and around over circular piles of golden grain to separate it from the chaff. He may catch an exciting glimpse of the great Condor bird, larger than the American eagle, soaring across the abyss of a canyon, perhaps keeping a watchful eye on a line of animals and men slowly negotiating a dangerous mountain trail. One of them might slip, fall half a mile. It happens.

Though long departed from American airline operations, the reliable old tri-motored Fords still are favorites for "tough" flying. This Panagra Ford flies freight and mail.



Some of the finest transport work in the history of aviation has been accomplished in the Peruvian Andes. Entire water supply and sewerage systems for isolated sierra towns have been lifted in 3½ ton loads over 15,000-ft. cordilleras. Mining equipment, with single pieces weighing a ton or more; entire hydro-electric plants; food supplies and medicine; bars of concentrated gold, are some of the other regular items of freight transport which have been and are today carried across the Andes by plane. The tri-motor Fords of Panagra, and the Curtiss-Wright *Condors* of Condor Peruana have shared in this significant phase of commercial development of Peru.

The latter company has extended its routes into the region known as the *montaña*. This is the zone of fields and woodland sloping to the Amazon jungle. Rich in mineral and agricultural potentialities, it is so isolated by lack of roads with the rest of Peru that it has always looked eastward for release down the Amazon, away from the country to which it belongs. Practically all travel prior to the advent of planes followed the sluggish brown rivers winding toward the mother river. A typical example of the change brought into this region with air service may be found in the journey from Iquitos, commercial center for the whole Peruvian Amazonas district, to Moyobamba, a montaña town formerly renowned for its output of "Panama" hats.

Leaving Iquitos overland one travels five days upriver by launch, five days up a smaller river by canoe, and finally three to five days by mule along a jungle trail. Intense heat, sudden soaking showers, and a variety of insect bites too complicated to mention are features of the trip. By plane the journey takes one hour and 40 minutes.

The Moyobamba airport is a grassed field about 800 ft. wide by 1,000 ft. long. It slopes slightly toward the Mayo river. You come in over this latter, turn around, and go out over it again, usually close enough to the treetops to count the leaves. When this field, (like most others of the sierra and montaña) gets wet, it is unsafe for landing. The jungle fields don't stop at getting wet; they disappear under a smooth sheet of water. During the rainy season planes are frequently delayed for two or three days. The dry season is distinguishable from the wet by the fact that it does not rain every day during the dry season.

There is something at once thrilling and awe inspiring in the first sight of this green immensity from the air. The plane emerges from clouded heights and rocky weather, and suddenly the air is smooth, the mountains gone. Instead, a vast forest spreads to the limit of horizon, level as the sea, and appearing at 15,000 ft. like a pasture for all dead cows since Creation. Losing unnecessary altitude, the altimeter soon registers 8,000 ft. and the pasture becomes an endless bed of spinach. At half that height the plane levels off.

(*Continued on page* 91)

Laying Out Tapered Wings

by PEYTON AUTRY

Many a home-builder has asked us for advice on a tapered-wing design. Following is our answer.

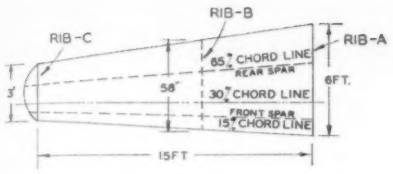


FIG-1

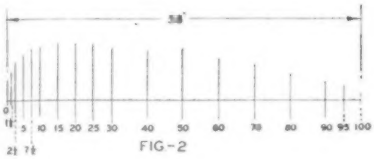


FIG-2

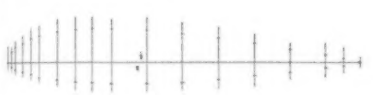


FIG-3

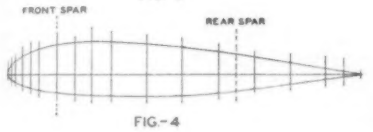


FIG-4

THIS article deals with the tapered wing as applied to the home-builder who wants this type wing, yet presenting little more difficulty than ordinary rectangular planforms.

There are two tapered wings which are of any value. One is said to taper in both planforms and thickness. In short, the airfoil at the root is a thicker airfoil than that at the tip. For example, if we have a wing which has an M-6 airfoil at the root (thickness = 12.01 per cent chord) having a six ft. cord and tapers to an M-2 airfoil at the tip (thickness = 8.06 per cent chord) with a three ft. chord—then that wing is said to be tapered in *planform and thickness.*

The other wing is tapered in planform only. If, in the above example, the tip airfoil was the same M-6 section as the root only having the three ft. chord, the wing would be tapered in *planform only.* In other words, the same airfoil is used, the chord lengths decreasing towards the tip.

The latter type is the one we will discuss here. First, because it is simpler to find the intermediate rib sections and will be ideal for the builder who has had no previous experience with tapered wings. Secondly, the other type requires knowledge of the *relative* characteristics of the two airfoils.

Let us assume that we have designed a wing such as that shown in Fig. 1 and is to be tapered in planform only, employing the N.A.C.A. 23015 airfoil shown in Fig. 1-A. Of course, our main object is to find the intermediate sections for building the wing ribs. First, lay out a plan view of the wing to a large a scale as possible. 1½" = 12" should be the minimum. A straight span-wise line is drawn to represent the 30 per cent chord point for average airfoils. Then the root chord (Rib A) is drawn with its 30 per cent chord point intersecting the span-wise line at right angles. At the proper semi-span distance (15 ft. in Fig. 1) the tip chord (Rib C) is located in the same way. The leading and trailing edges are then drawn in, by perfectly straight lines.

The locations of the intermediate rib sections are spaced along the 30 per cent span line. This spacing is about 12 to 15 inches. Using an architect's scale measure off the *full scale* chord lengths in inches, and write it alongside each respective chord. If this is done accurately the actual length of each rib is found in this way. These chord lengths are not shown on Fig. 1, except Rib B.

Practically every homebuilder is familiar with the laying out of an airfoil from information similar to the upper left column in Fig. 1-A. A chord line is drawn and the various percentage points are located on this line as shown in Fig. 2, and from these points are erected perpendicular lines called "ordinates of the chord". On these ordinates are located the points which form the upper and lower surfaces of the airfoil. These points are measured from the chord line shown in Fig. 2, 3, 4 and in upper right corner of Fig. 1-A. The distance of these measurements are equal to the respective values in the column in Fig. 1-A, times the chord length. The decimal points in the ordinate percentages should be moved *two places to the left.* The column of these percentages

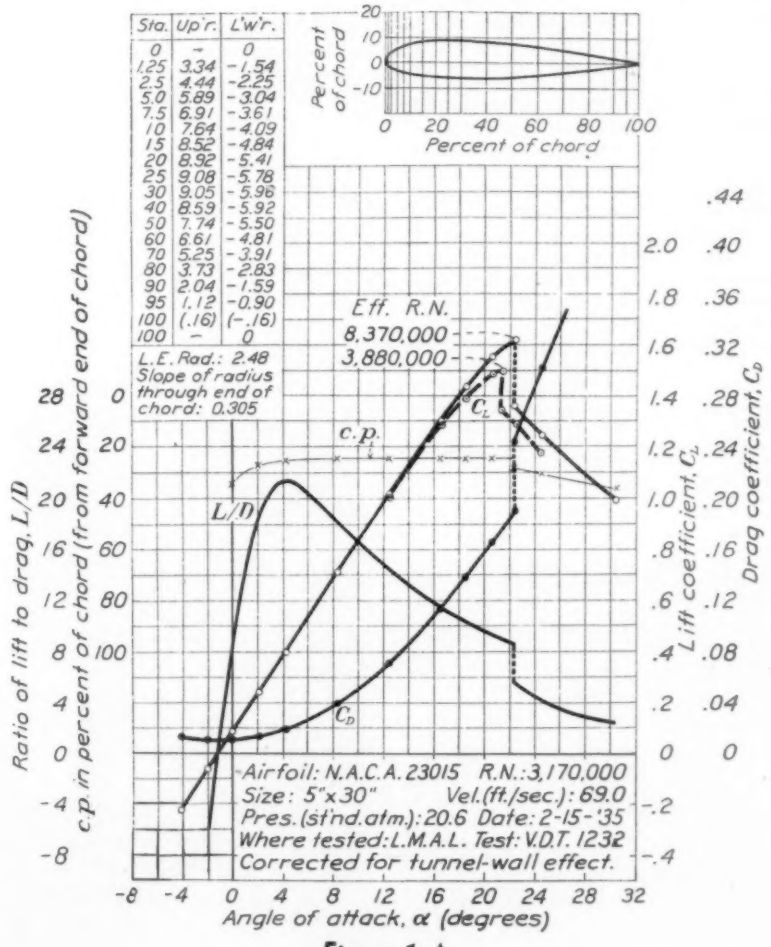

Sta. | Up'r. | L'w'r.
0 | - | 0
1.25 | 3.34 | -1.54
2.5 | 4.44 | -2.25
5.0 | 5.89 | -3.04
7.5 | 6.91 | -3.61
10 | 7.64 | -4.09
15 | 8.52 | -4.84
20 | 8.92 | -5.41
25 | 9.08 | -5.78
30 | 9.05 | -5.96
40 | 8.59 | -5.92
50 | 7.74 | -5.50
60 | 6.61 | -4.81
70 | 5.25 | -3.91
80 | 3.73 | -2.83
90 | 2.04 | -1.59
95 | 1.12 | -0.90
100 | (.16) | (-.16)
100 | - | 0
L.E. Rad.: 2.48
Slope of radius through end of chord: 0.305
Percent of chord
Percent of chord
Eff. R.N.
8,370,000
3,880,000
L/D
c.p.
C_L
C_D
Airfoil: N.A.C.A. 23015 R.N.: 3,170,000
Size: 5"x30" Vel.(ft./sec.): 69.0
Pres.(stnd.atm.): 20.6 Date: 2-15-'35
Where tested: L.M.A.L. Test: V.D.T. 1232
Corrected for tunnel-wall effect.
Ratio of lift to drag, L/D
c.p. in percent of chord (from forward end of chord)
Lift coefficient, C_L
Drag coefficient, C_D
Angle of attack, α (degrees)

Figure 1-A

is separated into values for the upper and lower surfaces. After all points are located, they are connected with a line —forming the airfoil as shown in Fig. 3 and 4.

Let us take Rib B in Fig. 1 for an example, and outline the procedure, methods for saving time, etc. Of course, all the other ribs sections will be found in the same manner. Measuring off Rib B we find it has a chord length of 58 inches. Taking a sheet of paper large enough to accommodate the layout, draw the 58 inch chord line, perfectly straight. The next step is to locate the ordinate positions. Looking on either Fig. 2 or Fig. 1-A and we find the largest divisions is 10 per cent. Then .10 x 58 = 5.8 inches. Measuring 5.8" from the 0 chord point and set dividers to this opening. Then "walk" the dividers along the chord line, locating each point. The dividers *must* finally come out exactly on the opposite end of the line. Then bisect these separations into the various other locations shown on Fig. 2 or 1-A, and erect the ordinates at all points. In this operation the dividers also serve as a good check on accuracy, therefore rely upon them.

The next step is to find the points on the ordinate lines to form the upper and lower curves. It can be seen that to multiply all percentage figures in Fig. 1-A by the chord length would be no mean amount of labor, at least for the entire group of intermediate sections. Therefore let us try to minimize this labor. For example, let us take the ordinate at 30 per cent chord. The figure for the upper is 9.05 per cent or .0905 and the lower 5.96 per cent or .0596. Since the chord length is constant for each ordinate percentage problem, let us make a "Table of Multiples" for all numbers from 1 to 9 for Rib B, as follows: (Each rib section will have a "table of multiples")

Table of Multiples (Rib B)

1 = 58
2 = 116
3 = 174
4 = 232
5 = 290
6 = 348
7 = 406
8 = 464
9 = 522

(Each number is multiplied by the chord length, 58)

Then instead of finding the upper point on the 30 per cent chord ordinate by multiplying, thus:

58
.0905

290
522

5.2490 inches

—we find it by dropping the 58 and taking the values from the Table of Multiples and adding only (the percentage figures similar to .0905 may be left for reference, etc.)—as follows:

(*Continued on page* 95)

The Full-Feathering Hydromatic Propeller

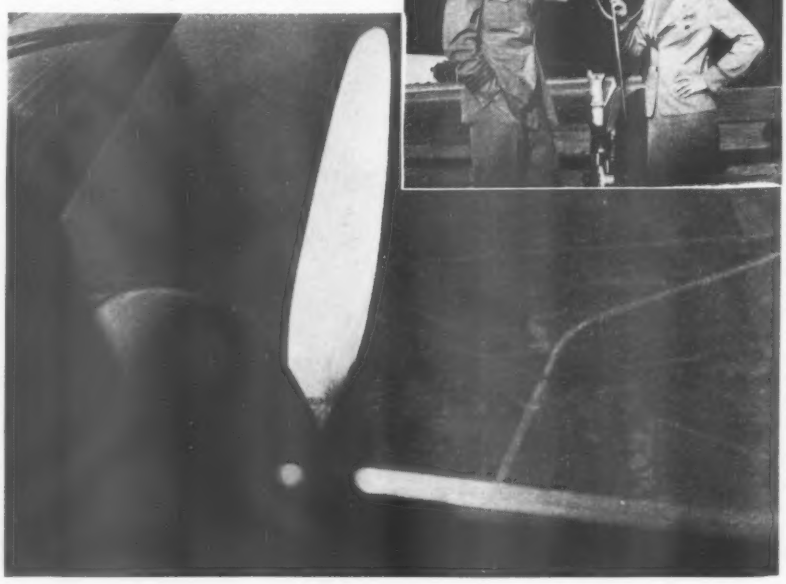
MAJOR U. S. airlines are busy fitting their Douglas DC-3 airliners with the latest innovation in propellers—the Hamilton-Standard full-feathering hydromatics shown on this page. An odd angle in connection with these propellers, meanwhile, is that, as this was being written, the advice is on the Army-Navy secret list—despite the fact that they now are in use in various sections of the country.

In addition to being somewhat of an improvement over the currently popular controllable-pitch and constant-speed propellers, the hydromatic has an important safety factor in its ability to be fully feathered by the pilot within eight seconds after stopping the engine. By feathering the propeller, the pilot actually causes the blades to turn about their axis (automatically, of course) until coming to a stop parallel to the airplane's line of flight. The air stream flowing around the blades, then, automatically stops the engine from "windmilling" or rotating. This reduces the drag to a minimum and eliminates all vibration so common in the past. This feature automatically improves the airliner's single engine performance considerably without having to use the maximum power available in the engine.

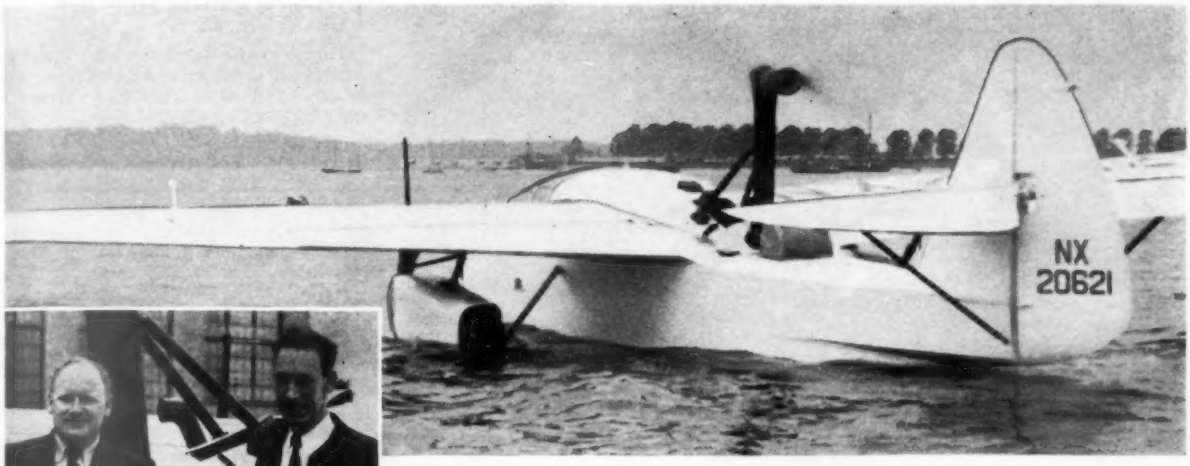
Both United Air Lines and American Airlines have installed the new propellers on their DC-3 equipment. United bought 87 of the new propellers at a cost of about $320,000 while American purchased 70 at a cost of approximately $260,000. Meanwhile, the recently test-flown Douglas DC-4 (see page 28) is equipped with Hamilton-Standard hydromatics as is Boeing's new huge flying boat, also recently test-flown (see page 13).

The Hamilton-Standard company at one time experimented with actual brakes somewhat similar to those on an automobile wheel. These, however, did not prove successful and the company's engineers devoted their efforts to the development of the blade-turning process. The original hydromatic propeller first was turned over to the Army Air Corps for testing. Then the airlines were given access to it. They in turn made many additional tests—many of them in the air—and finally placed contracts for enough to reequip their transports. During the course of these flight tests a number of newspapermen were taken on demonstration flights in big Douglas transports fitted with the new propellers. There was many a surprised start on the part of "veteran" passengers when, on looking out the window, they saw what the flight photograph below shows. However, despite the fact that the ship was almost fully loaded, the pilot not only maintained altitude high over a city, but maneuvered the ship as though its two engines were running. The dead engine started easily at "unfeathering."

The new propeller is shown feathered, in the air (below) and on the ground.



The Latest Thing in 'Ducks'



Recent taxying tests showed off the new amphibian as a water-going craft. It sits unusually low when afloat. The novel wing-pontoons also house the landing gear.

Victor Larsen (left) and P. H. Spencer

by M. H. CARRINGTON

Presenting the latest innovation in small amphibians for the private owner. Exhaustive tests have gotten under way.

UNUSUAL is the only word we can think of in speaking of the newly designed light amphibian shown in the accompanying photographs. Practically everything about the new Spencer-Larsen amphibian is a novelty, from the remote-drive propeller to the tricycle landing gear.

P. H. Spencer, formerly with Pan American Airways and now a partner in the new company, is making the test flights of the novel amphibian which has not yet been granted an Approved Type Certificate by the Bureau of Air Commerce.

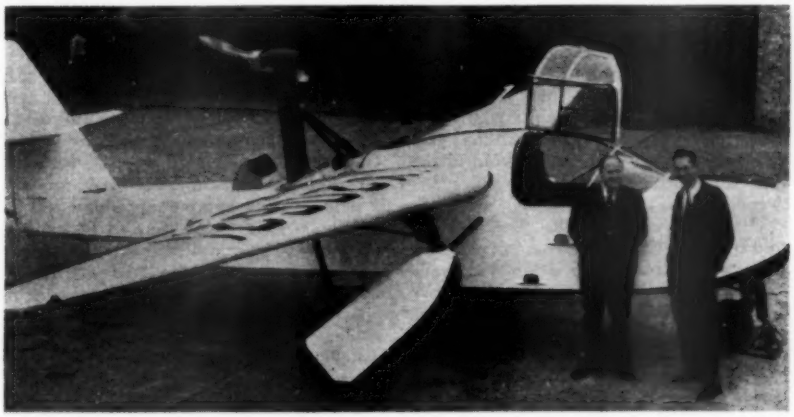
Powered with a 125 h.p. Menasco engine, the Spencer-Larsen amphibian's propeller drive from the engine is the first thing of radical design. A pusher, the prop is geared to the engine with an extension shaft. The engine itself is mounted in the hull. This latter feature is said to increase the plane's performance by about 30 m.p.h. In addition, the low center of gravity possible with this arrangement makes the ship unusually stable on the water. Another novel feature in this connection is that the engine and propeller drive as a composite part swings out of and above the hull in much the same manner as a typewriter desk. This facilitates inspection and repair work. According to the builders, this ship is the first heavier-than-air ship to use the Zeppelin-type gear drive pusher propeller which was designed and built by Charles Kirkham of Farmingdale, Long Island, New York. Incidentally, the Spencer-Larsen factory also is located at Farmingdale.

The new amphibian is two-place, side-by-side and has an estimated top speed of 125 m.p.h. It is fitted with a three-wheeled "tricycle" landing gear. The nose wheel retracts into the front of the hull, while the rear wheels retract into the wing pontoons. The ship has a 40 ft. cantilever wing, is approximately 26 ft. long and its gross weight is 2,200 lbs. It also is equipped with flaps. The ship itself is constructed entirely of plywood covered with a bakelite finish which is water-and corrosion-proof.

Both Spencer and Victor Larsen are veteran aviation men. Spencer, now president of the new company that bears his and Larsen's name, is the former president of the New England Aircraft Co., and also was connected with the Curtiss Aeroplane Company, Pan American Airways, Amphibians, Inc., and the Shell Oil Company.

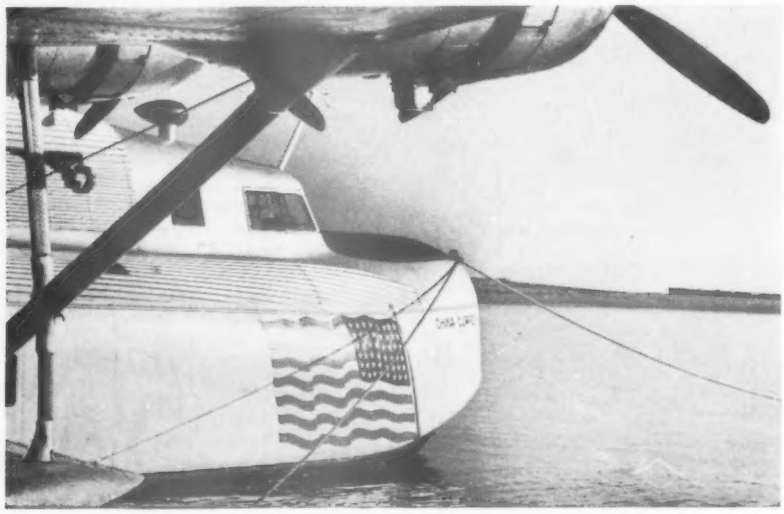
Larsen, vice-president of the new concern, formerly was an engineer with the Ingersoll-Rand company, was with the New Standard Aircraft Corp., was with Charles H. Day, who now is building airplanes in China. He was also with the Sikorsky company for seven years and took part in the construction of Sikorsky's famed clippers.

There has been a fairly great demand for an inexpensive small amphibian for the private flyer for several years. Whether or not the Spencer-Larsen machine is the answer remains to be seen. It seems to have a great many desirable features.



Notice the unusual landing gear arrangement and the propeller's gear housing.

Just In Case . . .



Jap warplanes could find little "excuse" for attacking the flag-bedecked Clipper.

THEY'RE not taking any chances on Pan American's trans-Pacific clipper service. After an uncomfortable brush with Japan's "undeclared war" on China, Pan American officials decided to make it as difficult as possible to mistake an arriving or departing Martin clipper for an enemy bomber. The above American flag is the result. Business on the trans-Pacific route, incidentally isn't so good as a result of the Sino-Japanese fracas. Best-paying division of the line is San Francisco-Hawaii. Still, because of the long non-stop run between those points (2,400 miles), the clippers can only carry seven passengers.

Amelia Earhart Lighthouse

ON a tiny pin point in the Pacific, remote Howland Island, the United States Bureau of Lighthouses has laid the cornerstone and begun construction on the Amelia Earhart Lighthouse in commemoration of this distinguished woman flyer.

Lying in the path of potential airlines to Australia, this minute kidney-shaped scrap of sand and coral, together with Jarvis and Baker Islands, was the incentive nearly three years ago, of a race between the United States and Great Britain. The United States won by a few days, and shortly thereafter the Department of Commerce took formal possession. In April, 1935, the U. S. Coast Guard cutter *Itasca* cruised down from Honolulu bringing colonists to each of the three islands for the purpose of collecting and assembling meteorological data. Since that time, four young Hawaiians stationed on each island have made hourly weather observations, providing the only service of its kind in the area of approximately 2,000 miles between Hawaii and Samoa.

The following year the three islands were placed under the Department of the Interior and an appropriation was made for their administration; and on January 8, 1937, the Coast Guard cutter *William J. Duane* sailed from Honolulu equipped with men and materials to build an airport on Howland Island. Notwithstanding formidable handicaps and obstacles the work went forward and the airport, boasting three magnificent runways and an approach said to be comparable to any landing field in the world, was built at desperate speed. Ironically enough, the airport was rushed to completion in order that Amelia Earhart might land on it. The story of this particular flight, tragically destined to be her last, is one with which everyone is familiar. She was last heard from shortly after she took off from Lae, New Guinea, on the 2,500-mile hop toward Howland and, as we know, was never seen again, although she should have landed there July 3, 1937.

Since the name of Howland is so strongly linked with this flyer, it seems particularly fitting that it should be chosen as the spot for a memorial to her. The lighthouse is to stand on the highest point of Howland, 25 feet above the sea, with a tower rising to a height of 20 feet. The cornerstone was laid by Ernest Gruening, Director of the Division of Territories and Island Possessions.

The lighting equipment, which will be of the acetylene gas type of 90 candlepower, will be supplied by the Bureau of Lighthouses and the actual construction, cutting the blocks from the coral rock of the island, will be done by the colonists, under direction of the Department of the Interior. The light will operate every four seconds on radio request from approaching ships.

Stewardess Dope

TWENTY Yankees, 16 Britishers, nine Irishers, etc., etc.

That's what happened when American Airlines press agents have nothing else to do — and when they have access to their airline's stewardess files.

Of the total of 120 stewardesses who fly for American, 100 are of foreign extraction — and don't think plenty of ground on the two hemispheres isn't covered. After compiling detailed data concerning their high-flying gals, the American newsmakers found such nations as Czechoslovakia, Holland, Norway, Austria, Denmark, Finland, Italy, Lithuania, Servia, Bohemia, France, Poland, Sweden and even Scotland and Wales represented.

Other "dope" on the gals is that so far as their birthplaces are concerned, 26 separate states are represented—along with three Canadian provinces. Training schools and their parents' residences would add another 10 states to that. Illinois leads the parade with 16 stewardesses claiming that state as their birthplace. Eight are from Ohio and seven from New York, Pennsylvania and Michigan.

One Ton of Plans!

PAN American Airways officials have their hands full these days. It's the result of those plans they called for recently. That line is seeking a radically new, huge ocean airliner and detailed specifications were submitted to American manufacturers.

To date Pan American's engineering department has received more than *one ton* of plans, designs and letters concerning such an ocean airliner from such firms as Boeing, Consolidated, Douglas, Sikorsky and Seversky. The latter's design, incidentally, calls for eight 2,500 h.p. engines and accommodations for 120 passengers.

Without Pants?

TSK! tsk! Aviation's coming to a pretty pass, judging from a recent bulletin sent POPULAR AVIATION by the Aero Insurance Underwriters of New York. Their bulletins contain warnings and suggestions concerning the operation and maintenance of aircraft. One item, we believe, went a little too far. Not that the insurance boys can't say what they darn well please (which they've done). It concerned the accumulation of frozen mud (in winter flying) in the streamlined housings for each landing gear wheel. These housings commonly are called "pants".

Anyway, after giving its clients a few well-made suggestions concerning the frozen mud, the bulletin offered the following sage note of advice:

"Note: Under such conditions, suggest you fly without your pants."

Woo woo!

"Clear and Unlimited"

By SWANEE TAYLOR

Those Cariocas . . .

Never in all your life have you encountered a more delightful and engaging people than the *Cariocas,* an Indian name for the people who settled the first community on an American continent, later to be known as Rio de Janeiro. The name means, "People Who Live In Big Houses," and has clung to this day to those who dwell in the Districo Federal —Rio. They are awfully nice folks, progressive without being aggressive; like to mind their own business and have fun; and are thoughtfully courteous beyond words. Were you lucky enough to live there you would automatically be a *Carioca,* entitled to click your heels and do everything the name gives privilege. And, let me remark, you would be mighty, mighty happy.

Now, this isn't to be a travelogue, nor is it to be a review of Brazilian aeronautics. Your correspondent was on vacation and had no intention of making it a busman's holiday—he didn't even go near the airport. Nonetheless he couldn't help but hear and observe a little about flying conditions in the land of the Southern Cross. These findings are relayed to you for whatever they are worth, don't put them down as gospel truth.

One thing, however, is very certain: The United States of Brazil needs aviation like no other country in the world to develop a vast wealth of natural resources. Brazil, you know, is about as big as our own United States with a couple of extra Texas' thrown in, yet the surface of her fabulous riches literally has not been scratched. Nor will the gold in them thar hills be properly uncovered until the important item of transportation has been taken care of.

Adequate rail transportation is out of the question because of the staggering cost of steel, let alone ordinary construction costs. Their inland waterways are few and serve only a tiny fraction of the country, principally jungles. The expense of building enough highways is too great for a total population of 47,000,000 men, women and children to bear. Which means that air transportation is the one workable solution for national prosperity.

Of course the Brazilians are fully aware of what part the airplane can and will play in the development of their country. But so are the Italians, the Germans and the French. Nationals from these three countries, with a liberal sprinkling of Englishmen, have landed in there feet first and are digging in like no infantry raiding party ever dug-in before a surprise artillery barrage. Only one American company—thanks to our kind-hearted State and Post Office Departments—can fly between North and South America. And when I tell you that it takes a letter only half as long to get from New York to Rio by air as it does by atrociously slow steamboat service we can be thankful that the air lines in this country had to knuckle down under the whip of competition. Anyhow, small wonder, what with slow mail service to Brazil afloat and aloft, that we get so little business out of that marvelous country.

Private flying lags woefully due entirely to import duties and an unfavorable exchange rate. There are very few flying clubs in Brazil and only a good sized hangar full of privately owned ships. Most of the ships, both lightplanes and larger craft, are American make. For some reason (probably quality), Brazil like the rest of the world prefers our equipment above all others. And, to risk a prophecy, they always will because, like some other things I can name, one of our national attributes is the development and production of superior aircraft.

In conclusion may I, as a fairly devout soul, say, God speed the day when our ships will fill the skies everywhere bringing men of many nations together in the mutual pursuit of peace and prosperity.

Thoughts of a Homewardbounder . . .

The shining cleanliness of Rio. They scrub the city every night and brush on it all day long. No slums and no shabby people . . . The Gloria Hotel; ah what a place (I should say palace) . . . The buxom little American girl (All-America Guard 1934), who wolfed steaks smothered with veal cutlets . . . We think our radio commercials are hard to take, but in Rio they have to put up with 3 and 4 separate advertising plugs between each song . . . That cable-car ride up to Sugar Loaf Mt. (Why does that man have to overshoot his landing at the top and slide back thirty feet and try it over!) One woman refused to ride back down again —they had to chloroform her . . . Women enjoy middle age down here, they don't sprout beards at 19 like in some places I know. (Age 32, is twice sweet sixteen) . . . Tonic Water, which is sometimes mixed with gin, may cool the blood in this hot climate but it tastes like quinine lollipops. Wonder if gin kills the bitter taste . . . The succulent Xuxu, (pronounced zchou-zchou, like Simon Simone), which is a he-man relative of our nice-nellie squash. It sticks to the ribs right okay.

The morning telephone operator at the Gloria with the Lily Pon's voice who was much better than grand opera as she chirruped, "Yes, sirrrr, rrright awayyyy!" when you called down for coffee . . . The Hollywood influence everywhere in Rio. The modernistic apartment buildings; the racy movie styles in bathing suits, etc. . . . Eddie Mueller, a grand *Carioca,* in the traffic department of Standard of Brazil. He meets all the visiting firemen and what a greeter he is . . . Everybody is a Barney Oldfield

(*Continued on page* 80)

Letters

SOS

Sirs:

At a conference of the aircraft manufacturers and Bureau of Air Commerce officials . . . we made the request for the air under 2,000 feet for non-schedule, non-instrument flying.

In order to accomplish this for the rapidly growing private market that is going to make your business more profitable, your support to obtain this regulation is essential. It is going to take the combined efforts of all the airport operators and manufacturers, through your magazine as the medium of expression, to accomplish this. We need editorials and articles showing the advancement of the private plane market and the need for this space under 2,000 feet for their activities so that they will not interfere with scheduled flying which is usually done at a much higher speed.

May we have your cooperation?

C. G. TAYLOR,
President.

Taylor-Young Airplane Co.
Alliance, Ohio.

• Though Mr. Taylor's plea to this magazine is not at all necessary, it is nonetheless welcome. The private flyer always has had, and always will have POPULAR AVIATION squarely behind him. —The Editors.

Soaring

Sirs:

The article . . . entitled "I Tried Soaring" (POPULAR AVIATION, June, 1938) is very interesting . . . I was wondering if you could publish more about this sport, explaining how gliders are made and flown. . . .

EDWIN BORMAN.

Mission, Texas.

• Let the unexpected amount of enthusiasm and interest in gliding and soaring directed by readers to POPULAR AVIATION be expressed instead to the Soaring Society of America, 1500 Locust St., Philadelphia, Pa.—The Editors.

Patriot

Sirs:

I would like to see your faces when you read what follows. In observing Air Mail Week, our town . . . printed some envelopes for a special mail flight in a Curtiss *Robin* from here to Boston. The design (on the envelope) advertises the city, of course, but there is also the picture of a Westland co-operation plane which, as you know, is a British military plane. . . . The thing was designed by a local newspaper cartoonist . . . Oh well, the public never knows, but honestly it burns me up . . .

ROBERT J. WHITTIER.

Brockton, Massachusetts.

• Pooh-pooh to Brockton's well-meaning but ignorant effort on behalf of Air Mail Week.—The Editors.

Shooting Stars

by JAMES P. EAMES

These familiar old flash signal guns, familiar during the World War, still are being used in the various government services and in civil aviation as well.

A GIANT Naval patrol bomber roars steadily through the night off the Hawaiian coast during fleet maneuvers. Its great *Twin Wasp* engines beat a thunderous tattoo. Vicious spurts of flame from their exhausts, jagged blue tipped with orange, stab the gathering darkness. Far below, the lights of the Pearl Harbor air station fade into oblivion beneath the gathering packs of fleecy cumulus clouds.

"Ought to pick up Kauai light in about 20 minutes," snaps the flight commander, tracing an imaginary course on his strip-map with a sun-browned finger.

Soon the last blurred fringe that is the island coastline is astern and the big bomber heads out into thousands of miles of nothingness. Only the vast, restless expanse of the tossing Pacific lies beneath her now. An hour passes. The powerful beat of the mighty engines is steady and true. The crew sit relaxed in their seats.

Suddenly a terrific hissing glare flares through the narrow hull. Everyone is instantly alert at his post. There is no sign of panic among these men trained, as they are, to strict discipline. The darkened flying boat, its thundering engines now strangely silent, starts the long glide down to the ocean's surface. The wind throbs and sings through the struts.

A comforting thought flashes through the commander's brain.

"Thank God it is calm down there tonight," he mutters silently.

The radio operator frantically "pounds brass." "Can't raise aid, sir," he gasps through grimly pressed lips to the commander whose presence he can feel rather than actually see in the inky cabin, "the whole electrical system is out."

The relief pilot, waiting to hear no more, leans out of his compartment porthole. His Very pistol is poised toward the upper sky. A sharp hiss ensues. Then the whole sky in the vicinity of the falling bomber is ablaze with brilliant stars, dazzling in their eerie whiteness. They hang suspended for an instant, things of wondrous beauty. One by one they descend, trailing yellow, sulphurous smoke, to die, hissing, in the black waters beneath.

To the south an aircraft carrier speeds shoreward, breasting the long ground swells. High up on the bridge eight bells tolls in the darkness. After the activity attending the change of watch subsides, all is ghostly quiet on deck.

The lookout starts, then stares unblinkingly to starboard. Unhesitatingly he cries out, "Airplane flare off the starboard quarter!" The watch officer takes a hasty bearing in the direction mentioned. A few seconds later he leaps to the bridge speaking tube. In response to his terse report the skipper emerges on deck. It takes this veteran officer but an instant to make his decision. "Flying personnel report to the ready room," he barks into the loud speaker system, "prepare planes for launching."

Black smoke belches from the carrier's stacks. Heeling slightly, she wheels into the wind. Like hornets disgorged from a hidden nest, trim fighters, scouts and bombers roar deafeningly off the flight deck.

It is merely a routine matter for the seasoned carrier pilots to locate the disabled flying boat and return to their roost. Soon the partly burned patrol bomber, dripping salt spray from her metal hull, is hoisted to the flight deck. Her commander gropes his way to the bridge to make his report. The crew head for the messroom and a welcome cup of steaming coffee. The prow of the carrier once more swings westward, Honolulu-bound. What might have been another aviation tragedy has been averted by the timely use of a signal flare.

SPEAKING of Navy flying, we suggest you get set for the excellent "biography" of the aircraft carrier, written exclusively for POPULAR AVIATION *by J. B. Hancock of the Navy Department in Washington. Mark your calendar now for the September issue, on sale August 10.*

But, what is a Very pistol, and how does it work? For answer let us look at the attached drawing. From its shape we see that it is indeed a pistol. The barrel is made of steel or aluminum, its diameter varying from that of a standard 10-gauge shotgun for the smallest model to 35 millimeters for the largest model. The 35 millimeter model, which is most commonly employed for aviation service, has an aluminum barrel five and one-quarter inches in length and weighs approximately two pounds.

Several types of signal lights are adapted for use with the Very pistol. The star cartridge, of the type which has been instrumental in saving the crew of our hapless patrol bomber, is, perhaps, the most commonly used. It consists of either a paper or metal cartridge case which contains the illuminating stars. The stars may be one of three colors—red, green or white. It has been found, however, that the greatest amount of illumination is obtainable with the white stars. The time of burning varies from five or six seconds in the case of the smaller model to 15 seconds with the larger aviation type.

Another form of illuminant is known as the "caterpillar." This device gives a chain of small lights which remain suspended vertically during the burning process. The white caterpillar, as used with the large aviation model pistol, burns from 20 to 25 seconds and radiates a very satisfactory amount of illumination. The cartridges for the large model are five inches long when they contain a single star. The more effective six-star cartridge, which also gives off a trailing plume of yellow smoke, is six and one-half inches in length.

A propelling charge of powder is also incorporated in the airplane type cartridge. This however is small, being just sufficient to clear the wing tips of the airplane. When fired vertically, the cartridge rises to a height of approximately 200 feet above the operator.

One form of Very pistol cartridge is provided with a parachute which holds the illuminant suspended for a period of ignition lasting from 10 to 15 seconds. This type can be made to contain any of the illuminants mentioned above, namely, the red, green or white stars, and the red, green or white caterpillars.

Many other types of signaling devices are used, too. No military aircraft ever takes off for a cross-country flight without smoke candles. These have the appearance of a metallic tube and weigh two pounds. They are capable of burning for three and one-half minutes. Wing tip flares are ignited electrically from the control panel in the pilot's cockpit. Pyrotechnic position lights, which are white flares designed to indicate a position or to illuminate an emergency landing field, are capable of burning for a full 10 minutes. These are so powerful that they can penetrate a haze which would blanket the beam of an electrical searchlight.

In conclusion, we hope that this little article has increased your stock of information regarding airplane flares. These devices are by no means restricted to military usage. The Bureau of Air Commerce requires all licensed aircraft operating between the hours of sunset and sunrise, or flying over large bodies of water, to be equipped with suitable signaling devices. Under this heading they include the Very pistol as well as the larger types of aviation flares. And just to prove that flares are in use somewhere every day:

Recently a Coast Guard amphibian airplane directed rescue ships to the aid of a floundering freighter in a howling southeast storm off Cape Hatteras by means of Very signals. They arrived not a minute too soon, either! A few wretched survivors were picked up from the icy, pounding seas to watch, horror-stricken, as vicious sharks devoured the bodies of their helpless shipmates, staining the tumbling water crimson in their frightful orgy.

END

The MAN UNDER THE HOOD

By D. W. W.

DOWN in torrid **Mexico** where men are caballeros and women are happy about it, **Gen. Saturnino Cedillo** of San Luis Potosi used two airplanes to bomb headquarters of government troops out to quell his rebellion. . . . The planes were much faster than government ships sent up to intercept them. . . . They came over, dumped their eggs and saucily turning away, outran the pursuers. . . . Government officials were mystified by the speed of the planes and the method **Cedillo** used to acquire them. . . . Last week the airplanes were captured on the ground and to international astonishment it was discovered they were **Howard** commercial cabin planes with **Wright** 320 h.p. engines. . . . **Benny Howard** sold them from his Chicago factory to gents in Texas who apparently turned them over to the rebel chieftain. . . . Even **Benny** was surprised when they turned up as fighting ships.

* * *

Don't believe any stories you hear about anyone purchasing tickets for the first passenger trip across the **Atlantic.** No such tickets have yet been made out, the schedules and rates have not been set, and there has been no decision—officially—as to when passengers might be able to make the flight. . . . Unofficially, **Pan American** will be ready to start carrying mail, passengers and express across this ocean after one of their new **Boeing** ocean passenger-carrying flying boats has been checked out over the route. . . . The first of these **Boeing 314's** started its test flying at the hands of **Eddie Allen,** in Seattle, last month. . . . Under the agreements reached by the governments of the **United States** and **Great Britain, Pan American** can be held up from flying into British ports until their **Imperial Airways** is ready to fly into the U. S. . . . And it is not expected that the British will be ready much before 1940 with equipment for a service equal to **Pan American's.** . . . Whether the British government will invoke this clause in the reciprocal agreements in order to protect its "chosen instrument," **Imperial Airways,** remains to be seen. . . . However, **Pan American** holds clear operating rights in the **Azores** and **Portugal** and so could establish service, at any time, on the New York-Azores-Lisbon route. . . . **Pan American** does not plan any more survey flights—they've been surveying the **Atlantic** since 1930. . . . But **British, French** and **German** competition—possibly also the **Italians**—plan a summer's schedule of surveys again this year. . . . Barring unexpected political hitches, **Pan American** should be ready to start service across to **Europe** on regular schedules as soon as the first of the **Boeings** is ready—say some time in September. . . .

* * *

Tex Rankin is planning a Hollywood stunt trio—himself, **Frank Clarke** and **Paul Mantz,** with all three flying **Great Lakes.** . . . At the moment he hopes to have each ship a solid color—one red, one white, one blue, and to have each ship in turn expel red, white, and blue smoke during the stunt exhibition. . . . You ought to be able to see all three in action at the National Air Races—Sept. 3 to 5, at Cleveland.

* * *

Do any of you remember the famous Army stunt team trio—The Men On the Flying Trapeze? . . . **Maj. Claire L. Chennault,** the element leader is now chief advisor to the heads of the **China National Air Force.** . . . With him as aide and instructor to Chinese military pilots is **W. C. McDonald** who was one of the two wing-men. Both men have been at **Hankow** for months. . . .

* * *

Neither, however, has done any fighting for the Chinese and **Chennault** did not lead the raid on **Formosa.** . . . That was conducted throughout by **Russians** in Russian-built planes. . . . **Chennault** has been flying a very old and shabby **Curtiss** *Hawk* 75—the all metal low wing monoplane with fixed landing gear. . . . **McDonald** has done a lot of instructing in **Fleets** and some ferry work in **Martin** bombers.

* * *

A friend of ours who was flying with the 14th squadron—the international group which had **American, French, English** and **Chinese** pilots—has just returned to the U. S. and tells us that most of the airplanes used so far by the Chinese have been American. . . . **Vultee** bombers, **Martin** bombers, and the early **Northrop** attack planes, all with **Wright** *Cyclone* engines. . . . On the same field were some old **Curtiss** *Hawk* IIs and *Hawk* IIIs. . . . The **Bellanca** 28-40 monoplanes built for **Air France** turned up at **Hankow** just before our friend departed. . . . They had no armament of any kind and the Chinese couldn't find a place to hang bombs or put machine guns, he said. . . . The day he left the first of a new batch of Curtiss 75s arrived.

* * *

It has become a gentle habit in that China war to paint out the insignia on an airplane's wings. . . . This is contrary to all international law, but what do either the Chinese or Japanese care about Occidental amenities such as these? . . . The Chinese, my friend said, also had a habit of carrying their high officials from place to place in **Beechcraft** biplanes which carried red cross markings, presumably so they wouldn't be attacked by the Japanese. . . . He says that both Chinese and Japanese pilots of certain squadrons have been flying **Dewoitine** monoplane fighters and since both sides refuse to put any identifying marks on the ships the Chinese occasionally fly a formation with the Japs and vice versa.

* * *

During the somewhat ludicrous **GHQ Air Force** maneuvers up in New England there came a night when a sound detecting battery and its companion searchlight units was to watch for raiding bombers over a village where all lights were out. . . . Round about stood a lot of bigwigs and newspapermen. . . . The zero hour arrived, all lights went out, silence settled over the land. . . . Then came a low penetrating note which almost escaped those listening but which caused the utmost confusion in the sound detecting battery. . . . The detectors pointed in all directions at once. . . . Then came the sound again. A civilian looked down to see he was standing on one leg of a frog.

* * *

All this stuff about how the new big airplanes will need larger airports for their safe operation is the bunk. . . . We told you months ago how pilots who had flown the Army *Flying Fortress* bombers reported that they took off as quickly and landed as slowly as much smaller light planes. . . . Now listen to **A. E. Raymond,** chief engineer and vice president of the **Douglas Aircraft Company,** on the landing and take-off characteristics of the 65,000 pound **Douglas DC-4:**

"The length of runway required to come to a stop if engine failure occurs just before reaching flying speed is 3,410 feet for the DC-3 and 3,305 feet for the DC-4 for a sea level field.

"The take-off distance over a 50 foot

obstacle if one engine fails immediately after reaching flying speed is 3,775 feet for the DC-3 and 2,640 feet for the DC-4 at sea level.

"Landing is normally less critical as to distance required than is take-off. The distance required to stop, when landing over a 50 foot obstacle at sea level is 1,667 for the DC-3 and 1,400 feet for the DC-4."

Our comment is this: Any field that is safe for operation of the 24,500 pound DC-3 will be entirely adequate for the **Boeing** and the **Douglas** four-engined planes.

* * *

The new German air force fighters—**Messerschmitt** Bf-109s—with Diamler-Benz liquid cooled electric-ignition engines, are now said to have speeds even higher than those of which we told you a couple of issues ago. . . . The latest version of this all-metal, low-wing fighter is supposed to do 444 m.p.h. at 13,000 feet. . . . This additional speed was obtained by stepping up the engine's delivered power from 910 h.p. to 1,360 h.p.; by using wings of extremely thin section; by reducing the span slightly, and from using what they say is a "thrust-giving" radiator. . . . And the landing speed stays at 65 m.p.h. Due, presumably to "Venetian blind" flaps and slots. . . .

Germany also has a new bomber—the **Dornier** high-midwing bi-motored twin-tailed machine designated the Do-17. . . . It too has the Daimler-Benz motors, these being the older 910 h.p. type. . . . Latest types have speeds of 332 m.p.h. with a useful load of 1,984 pounds. . . . German **Heinkel** bombers, the 111s, also bi-motored machines, officially did 313 m.p.h. for 621 miles with a load of 2,205 pounds. . . .

* * *

According to **Seversky** officials, that large batch of two-place export fighters, now going through their plant, is destined for **Siam.** . . . What does so tiny a country as **Siam** want with such a fleet of modern warplanes? . . . Upon questioning, **Seversky** officials said **Frank Sinclair,** chief test pilot for that company, "is in the Orient." . . . We asked for a little more dope on that contract. . . . **Seversky** officials wired back: "SINCLAIR SAILING FROM CHINA TUESDAY (JUNE 14) FOR NAPLES. EXPORT CONTRACT YOU REFER TO WITH SIAM. . . ." Incidentally, the reason not a single **Seversky** fighter took part in the **GHQ Air Force** maneuvers was because of trouble with the bearings and cooling of the *Twin Row Wasps* powering these ships . . . terrific power-dives by **Army** pilots caused the breakdowns. . . . the trouble has since been corrected. . . .

* * *

Benny Howard and his beautiful wife, **Mike,** have settled their suit against the **Lycoming-Smith** propeller company. . . . The **Howards** charged that the company was at fault in representing to them that the **Lycoming-Smith** propeller on *Mr. Mulligan,* the **Howard** racer, was in perfect shape for the 1936 National Air

(*Concluded on page* 90)

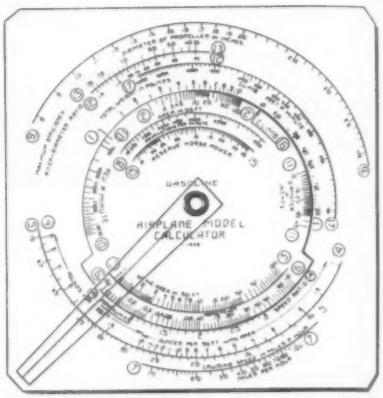
Gasoline Airplane Model Calculator

SOMEBODY left a new calculator on our desk that seems to be a very ingenious device. By it, the gas model designer and builder can easily and quickly determine the various characteristics of gas models, especially those intended for contests conducted under the new rules requiring a power-climb of 30 seconds followed by a glide.

The calculator consists of a cardboard base, a dial and a celluloid indicator arm, together with complete table of settings.

In a few minutes, by the use of the G. A. M. Calculator, you can calculate the wing loading, the climb, the diameter, pitch, efficiency of the propeller, the top speed, etc.

It takes a lot of guesswork out of model design and it should be valuable to the builders who take their work seriously.



Above is a photograph of the gas-model calculator which was designed and produced by Raoul J. Hoffman, a frequent contributor to POPULAR AVIATION.

A New Book by Weems

THE indebtedness of navigation to Lieutenant-Commander P. V. H. Weems has been materially increased by the British Empire edition of his *Air Navigation,* just published by McGraw-Hill (490 pages). The American edition appeared in 1931, and has been valued by all engaged in aviation.

In the course of preparing the new material for this edition, Weems spent four months in England, during which time he was in touch with officials of the Admiralty, Air Ministry, Imperial Airways and Air Service Training, so that he has been able to present the English point of view where necessary. In his preface he pays a graceful tribute to Mr. A. J. Hughes, of Henry Hughes & Son, Limited, through whose public spirit the preparation of this edition was rendered possible.

There are four methods of determining the position of aircraft, namely air pilotage or the observation of landmarks, dead reckoning, radio and celestial navigation. As three of these are used at sea, the marine navigator will find much that is inspiring. Although air navigation in its early days was based on the methods used in marine navigation, it has, in many cases, outrun its master, and today the former master is learning from the pupil. There is, however, one fundamental difference between the problems facing the two types of navigator. If a ship is in fog in a dangerous area, it can go slow or even remain stationary. An aeroplane must keep moving, and can do so only as long as its fuel lasts.

The early chapters on maps and compasses will be read with interest. The use of the gyro compass in its azimuth-seeking form is not feasible in the air, but gyroscopic instruments are used for maintaining level flight, for maintaining a fixed direction for say 15-30 minutes, and to indicate turns. The "automatic pilot," which operates all the controls of an aeroplane, is controlled by two gyroscopes. The advantages of repeater dials, usually associated with gyroscopic compasses, are however available from the Holmes telecompass, an aperiodic magnetic compass.

The practice of dead reckoning is much more difficult for the aviator than for the navigator. The medium in which the latter moves, namely the water, is subject to the movement known as currents, but the effect of this movement can be estimated with reasonable certainty. The effect of movement in the aviator's medium, or, in other words, the effect of wind, is much more pronounced, and is difficult to measure. Hence the need for the other methods of determining position is greater. Radio is used more in aviation than in navigation, partly because the greater part of a normal flight is over land, but also because (when available) it affords the best means of determining position when the ground and the stars cannot be seen. It is invaluable for conveying information about the weather, on which the aviator is very dependent. It is now possible to land in fog at aerodromes equipped with blind landing radio beacons.

The navigator will be particularly interested in the application of celestial navigation. The first difficulty in the air is the usual absence of a natural horizon, or, if this is available, the uncertainty in the dip due to lack of knowledge of the exact height above this horizon. This has been met by the introduction of bubble sextants, which contain their own horizon, and so eliminate dip.

Aviation in the Public Schools

by ROBERT RANKIN

If there is any place the basic fundamentals of aviation should be taught, it is in the primary schools. Happily, a few progressive organizations already have started classes.

SINCE it has such universal appeal, aviation is fast being recognized as being of utmost value to modern educators.

As an independent field of study leading to a career, it is a necessary part of the curriculum of every progressive school. In addition to this, since it does embrace a variety of other subjects including geography, history, arithmetic, meteorology, geometry, astronomy, and mechanics, aviation becomes an important aid to teachers of science and social studies.

In the science department of the high school, aeronautics can readily be worked into the course of study. By its very nature, it offers an interesting and up to date application of well known laws of mathematics and physics. Although such an application of the subject is academic rather than vocational, it does result in the student getting a definite idea of the fundamentals of aerodynamics, as well as a fuller understanding of the problems of air transportation.

Of great importance is the fact that the introduction of aviation into a given science course does not call for a great outlay of money, time, or materials. The most of the apparatus necessary can easily be constructed in the school shops from materials readily available. For instance, the Crane Technical High School in Chicago, has been supplied with a rather complete set of equipment made by the instructor aided by his students.

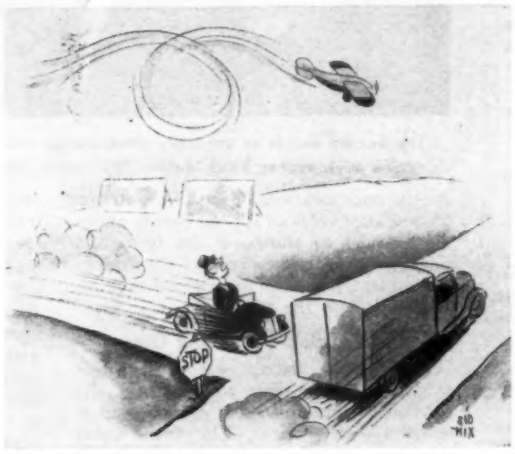
Of particular interest is the wind tunnel which was built. Consisting of a fiber waste basket, an electric fan, and a lever arrangement attached to an ordinary spring scale, this inexpensive piece of apparatus affords the students an excellent opportunity to study the effect of an air stream on various objects.

In a like manner, a simple sextant made up out of veneer offers the students an opportunity to make a study of the principles of aviation. Other simple home-made instruments are used to teach thrust, drag, effect of change of center of gravity in an airplane, as well as the various forces which are brought into play when changes are made in direction and amount of forces applied to a flying machine under flying conditions.

In this particular school, the study of simple aerodynamics is treated in the same manner as is the regular laboratory work and the standard "write-ups" on all experiments are required.

In connection with a discussion of home-built equipment for the study of aviation, too much stress cannot be placed upon the importance of model building. The fact that the building of airplane models can be supervised by almost any teacher, particularly the shop instructors, makes it possible for even the school with the most limited finances and equipment to offer constructive work in the field.

Although model building does not perhaps have the technical value that is offered by laboratory study, it does afford students an excellent opportunity to intelligently grasp certain fundamentals of mechanical flight.



"You wouldn't catch me pulling a crazy stunt like that!"

At the same time, since the model builder must make intelligent use of drawings if his model is to be a success, the student obtains valuable experience in the use of tools and blueprints. In addition to this, and perhaps more valuable, is the fact that those building models are taught a definite sense of craftsmanship. It is a poorly organized school indeed which does not have at least one model airplane club.

In the social studies department of the school, the introduction of aviation into the courses provides a definite tie-up between the course and the modern world. Since transportation is one of the greatest factors in any civilization, too much importance cannot be attached to the place which aviation occupies in the transportation scheme.

Actual class room experience shows that the average instructor can introduce a general informational course of aviation into social studies with little effort. Students would gain much of worth from a study of the historic angle, including the effects of transportation on civilization; the development of aviation, and the effect of aviation on world problems.

Economics would enter into the course of study with attention being paid to the commercial application of aviation; cost of operation; rates of operation, and insurance. Operation would be of importance, with a study being made of types of flying equipment, airways, airports, and meteorology.

Then, a social studies course, in so far as law is concerned, could not be complete unless some work were given in air law and governmental regulation. Thus, it can be readily seen, that aviation is as much a part of social studies as other factors, such as national development, citizenship, and such.

In the technical high school, aeronautics is of prime importance, particularly from a vocational angle. In such schools there is almost unlimited opportunity to teach a degree of technical information and skill not obtainable elsewhere.

This work includes hand and machine tool experience, acetylene welding, aircraft engine testing and repair, metallurgy, airplane construction, mechanical drawing (aeronautical), and lighting and ignition (aeronautical).

In connection with this work in the school, important projects such as aircraft repairing and the building of gliders can well be carried on. At Cass High, the students applied their knowledge of welding and aerodynamics in building and flying a glider. The importance of such work in the public schools cannot be overestimated.

Even practical flight training can be given in connection with school work if the public and the school administrators can be made to see its importance. The school board of Teaneck, N. J., realizing the place which aviation does occupy in modern life, purchased a small training plane and flying lessons were offered to interested students. In this instance, each student was required to secure his parents' permission to receive the instruction, which leads to a private pilot's ticket.

(*The State of Tennessee suddenly leaped into a pioneering role recently by buying a fleet of lightplanes and offering flight training free. An exclusive article on it will be in this magazine next month.—Ed.*)

END

Build the Novel BUMBLE BEE

by PAUL W. LINDBERG

POPULAR AVIATION Model Editor

MANY requests have been sent in asking for a snappy little biplane and we are proud to present this marvelous little ship which can be easily built as a gas engine-driven model or rubber-powered model. A small insert on the plans fully describes how to install rubber-powered motor, if ship is to be flown with one: Flying it as a rubber-powered model, a propeller with greater blade area is needed. I recommend your using a propeller from a prop blank size as follows: ½"x1⅛"x10".

If powered with the ⅛ h.p. *Hornet* engine, installation and details are clearly shown on the plan. A great deal of wing area is had in this particular model, although it has only a 30-inch wing span. Model is built complete and wings are not detachable as its small size is very easily handled. By enlarging plans four times shown, the correct size will be had.

The Bumble Bee is an unusually clean design and can be flown either with a gasoline engine or a rubber band motor. This model resembles the Knight Twister somewhat.

Construction of Fuselage

The main longerons of the fuselage are of strong ⅛ inch square balsa. Place wax paper over the plan to prevent the fuselage sides from sticking to the drawing. After the two fuselage sides have been constructed, cross members are next cemented in place. The tail pieces of the fuselage is comprised of a solid piece of balsa. Fire wall is made from $\frac{1}{16}$ inch thick veneer.

All formers are cut from $\frac{1}{16}$ inch thick sheet balsa and are cemented in their proper locations. $\frac{3}{32}$x⅛ inch stringers are attached and spaced evenly about the formers as shown in the front and side views of plan. Photo of the framework clearly shows all extra bracings, etc., built into the fuselage.

Construction of Landing Gear

The type of landing gear used on this model is very simple to construct. It consists of three pieces of $\frac{1}{16}$ inch spring-tempered steel wire. The front outer piece forms the axles for the wheels and continues up into the fuselage where it is securely bound with heavy thread and cement. The rear wire is bound to the front wire and continues up and across the bottom of fuselage.

Fill in space between the $\frac{1}{16}$ inch landing gear ribs with sheet balsa, sizes shown on the plan. Carve and sand to a streamline shape then cement and bind with thread as shown on plan. After this has been done, cover the complete strut with bamboo paper. This will add to the strength of the strut. Model is equipped with 2¼ inch streamlined puncture proof Aero wheels.

Construction of Elevator and Rudder

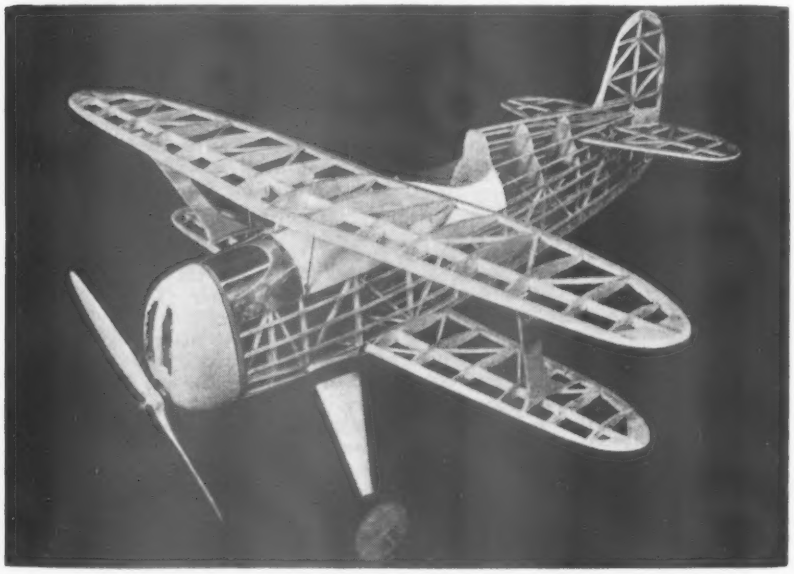
The construction of the elevator and rudder is very simple as both are built of a flat section, ⅛ inch in thickness. Construct upon a flat surface so that they will not have a tendency to warp. Neither elevator or rudder are adjustable and are held securely in place with a small brace wire which passes through elevator and rudder. That wire is so arranged that it may be adjusted for tautness (see detail on plan). Do not omit the small aluminum pieces which are cemented on the elevator and rudder for wire to pass through. This prevents wire from cutting into the balsa.

Insert sheet aluminum tab in trailing edge of rudder, this is necessary to give the model directional control as the rudder is constructed as a fixed unit and cannot be moved. Adjust tab at a very small angle of degree at a time so as not to over-control the model.

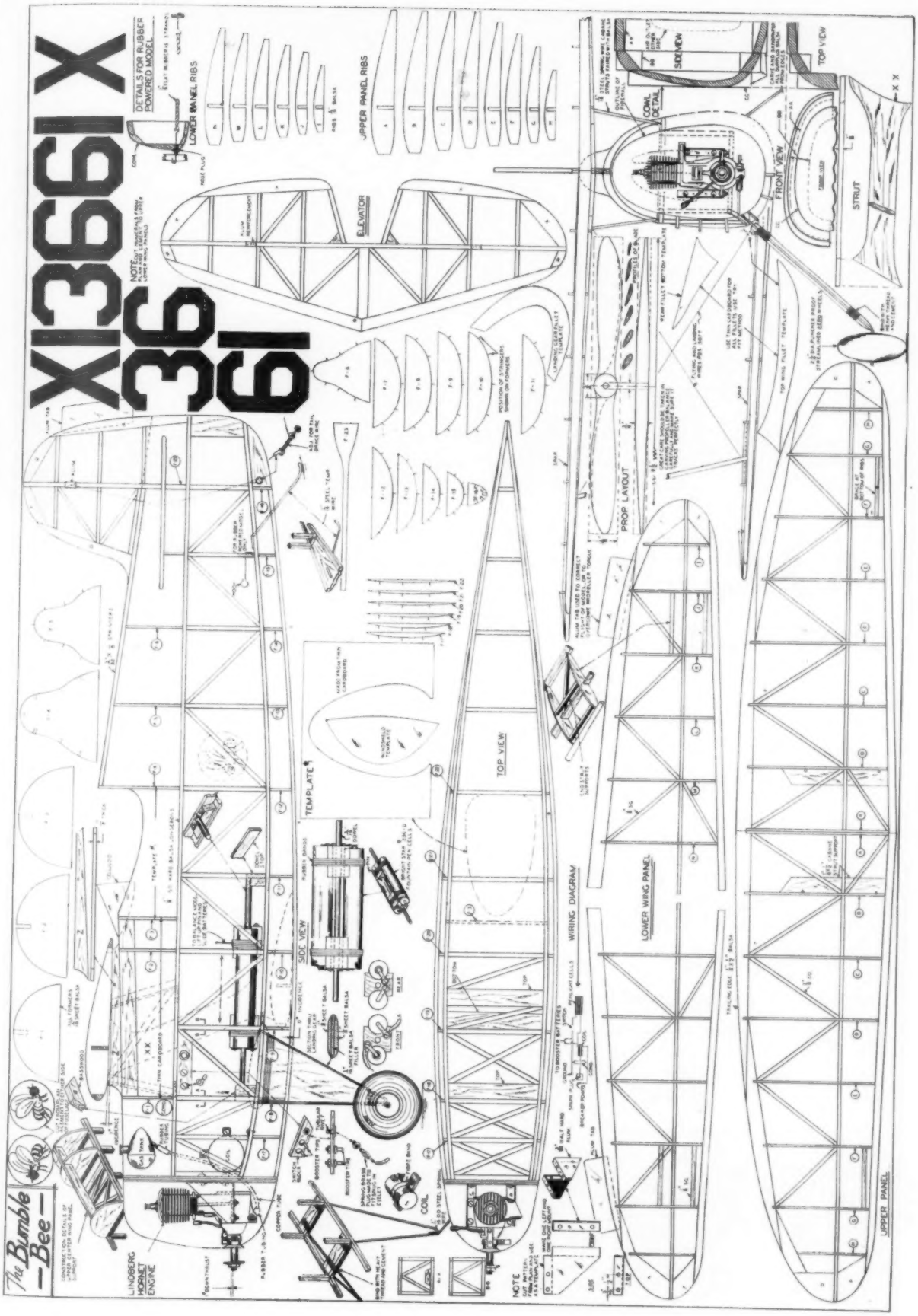
Construction of Wing Panels

All ribs are cut from $\frac{1}{16}$ inch sheet balsa. After notches have been cut into the ribs, cement ribs over the spars. After the leading and trailing edges have been carved and sanded to their proper

(*Concluded on page* 95)



This photograph of the Bumble Bee's framework shows the many extra bracings built into the fuselage. The rubber-powered version calls for a propeller of greater area.


X1361 X
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61
The Bumble Bee
DETAILS FOR RUBBER POWERED MODEL
LOWER PANEL RIBS
UPPER PANEL RIBS
ELEVATOR
SIDE VIEW
TOP VIEW
FRONT VIEW
STRUT
COWL DETAIL
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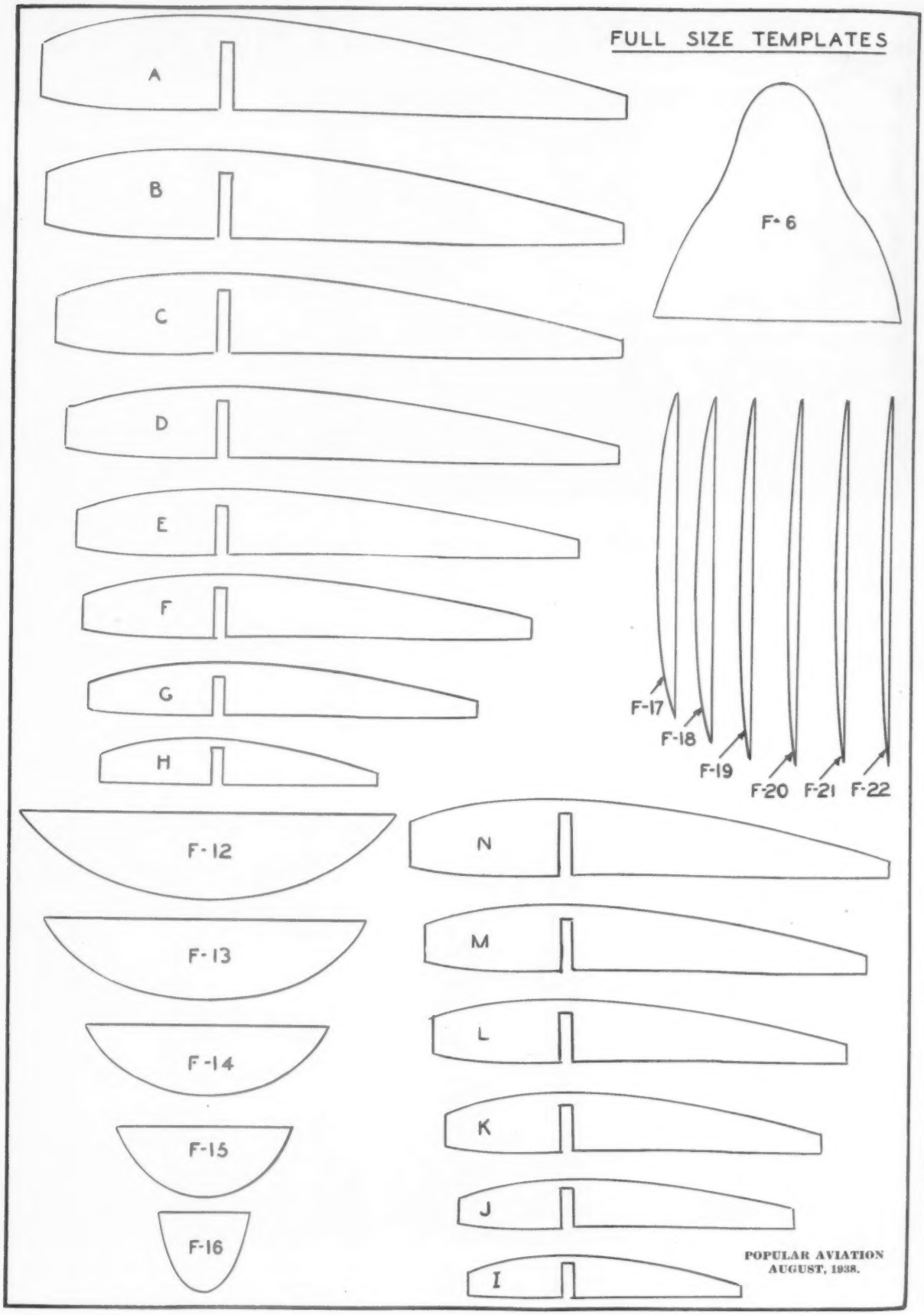
WIRING DIAGRAM
LOWER WING PANEL
UPPER PANEL
LINDBERG HORNET ENGINE
NOTE


FULL SIZE TEMPLATES
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POPULAR AVIATION
AUGUST, 1938.

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For more than six years Cub airplanes have been powered by the dependable Continental A-40 engine. However, with the introduction and approval of the Cub with 50 horsepower, the high performance of this popular ship is greatly enhanced—quicker take-off, faster climb, more speed. Now, in addition to the regular 40 horsepower models, the Cub is available with the following 50 horsepower engines:

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COUNT THE CUBS

THE WORLD'S FASTEST SELLING AIRPLANE

Flivver Flight

(*Continued from page 24*)

gallons of gasoline. They had indicated that an emergency refueling might be needed at Baltimore, so a crew was sent from Newark for that. The PX sent out from Raleigh when they left indicated they would pass over Baltimore at 6:30 p. m. When no word came over the teletype by 7:30 fears began to rise that they had been forced down by weather somewhere along the line. Just as a general query went out for any reports on them, they flew in over Newark at 8:00 p. m. For some reason no one called the control tower and the floodlights weren't switched on. The two pilots came in anyway and made a decent landing. We had had some fear that their battery for the navigation lights might have been run down but the lights were bright as they came in. The story later told indicated that they had even taken up new batteries at Jacksonville to replace those which had run down.

If Kress looked like a deacon when he left, he looked like a sexton when he came in. The first reaction was that both he and Englert had been on a three week "bat." Haggard and worn, they were almost without voice. Boog was hoarse and could talk very little, Kenny had trouble walking. A humorous incident, however, occurred when Kenny remarked, "It's funny how you can accumulate things on a trip." The inside of the cabin certainly looked it. Thermos bottles, bags with food in them, oil cans, soda bottles, weather maps, etc., were all over the floor and in the baggage compartment. By the time the news photographers were through, the two pilots were carried to the car and taken to a hotel for a good rest which they surely deserved.

Even the day after, Kenny reported all he could hear was "on course" signals, "A" and "N" messages. He had had his earphones on almost continuously during the flight and it's little wonder that he could hear much else than that.

Their total elapsed time in the air was 63 hours and 56 minutes which broke the former record of some 36 hours by a good margin. The record was previously held by Russ Finefrock and Howard Naylor in a *Cub* at Tyler, Texas.

In distance the pilots established a new mark which had had no precedent. Their total straight line mileage was 2,420 from Newark to Miami and back to Newark. The only previous lightplane distance record was made by Wilson Mills of Orlando, Florida, some 700 miles. Total gross distance probably figured better than 3,500 miles.

Kress, who already holds the record for the most airplanes test flown, now has two more distinctions to his credit. And one of the most conclusive things is that they have definitely proven that the modern light airplane is not a toy. They flew it against terrific headwinds, they had every known bad weather condition, yet the flivver plane came through and showed to the world in general that that type is an average man's airplane that can take him places.

Statistics on the flight: 238 gallons of gasoline were passed up to the boys—a total of 1,428 pounds.

They took off from New York with seven quarts of oil in the tank and six quarts in the baggage compartment. Oil was inserted by putting quart cans in a funnel, just big enough to hold a can to the right of Kenny's face (in front seat). A small hole was punched in the can, the quart running out in an hour or so. A bleeder line ran down the left wheel pant. Oil continually poured out of this, allowing new oil to be used almost continously. At Jacksonville they took on 19 quarts of oil at one time.

The average gasoline consumption was 3.7 gallons per hour, which is excellent, considering the high loads carried.

Average engine speed during the trip was 2,100 r.p.m.

The highest altitude they got was 4,000 feet.

All they ate was sandwiches and coffee.

At Jacksonville they passed up nine quarts of water for drinking, but they boys threw it out because it was sulphur water and they couldn't stand it.

Originally they had planned changing seats while flying, having practiced in mid air at Lock Haven, but with radio overhead and other equipment there wasn't room for it.

END

Trans-Canada's Lockheeds Are SPERRY-Equipped

For its pioneering coast-to-coast service, Trans-Canada Air Lines has chosen a fleet of speedy Lockheed transports. All ships of the line will be equipped with instruments and Gyropilots made by the Sperry Gyroscope Co., Inc., Brooklyn, New York.

SPERRY

Mr. Link Didn't Miss

(*Continued from page 48*)

much flying these days with the rush of business at the two plants and the task of supervising operations. He does commute between Binghamton and Canada however, and in this way gets enough hours to keep his pilot certificates in force. Since he started flying in 1926, Link has been fortunate as far as mishaps are concerned. Only once has he had trouble. That instance occurred when a ship nosed over in the mud at a Binghamton airport soon after he got into aviation.

His experience has been picked up "here and there" without attendance at a school of aviation. Actual experience is responsible for most of his flying ability. But he doesn't recommend this method of learning to fly and urges all prospective birdmen to study if they hope to become accomplished aviators with a thorough knowledge of the game. "My flying has been as limited as my experience," he admits. Today, Link owns and flies a Stinson, and a tri-motored Ford.

He is highly optimistic as to the future of the Link trainer. Who wouldn't be, considering the giant strides that have been made in the development of the device since the early days? With the invention "very thoroughly covered by patents" and with no competition, Link has extensive plans for its future development. Instruments, used by the blind method, are the salvation of flying, he maintains. The pilots of the old regime who thought they didn't need instruments are all killed off, is his contention.

Citing the fact that all recognized schools and all airlines in the United States are using trainers in their pilot instruction, the young inventor is confident that all types of weather can be conquered by aviators who are highly trained in meeting just these conditions. The "sadder but wiser" flyers who learn to meet emergencies through actual experience in the air and without preliminary instruction are on the way out of the picture, he predicts.

Despite his comparative youth, Link has had wide experience in the air. In 1931 he did considerable high altitude mapping for Curtiss-Wright, working over New York state and northern Pennsylvania. The work included the mapping of some 5,000 square miles at an altitude of approximately 18,500 feet.

Ask what he thinks of the dangers of flying, Mr. Link will promptly inform his listeners that "they're a myth", adding that it all depends on the pilot and his knowledge of what he's doing. But, at any rate Mr. Link is making aviation safer for democracy and perhaps this is kin to the thought.

Married several years, and just recently a father, he believes that he's in the greatest business in the world—making flying safer.

END

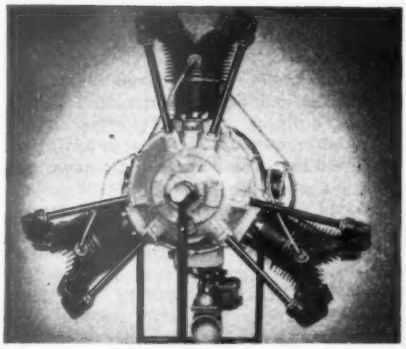
LENAPE 50 H. P. "PAPOOSE" ESTABLISHES DISTANCE AND TIME RECORDS IN LIGHT PLANE ON NON-STOP FLIGHT — NEWARK TO MIAMI AND RETURN...

63 HOURS—54 MINUTES

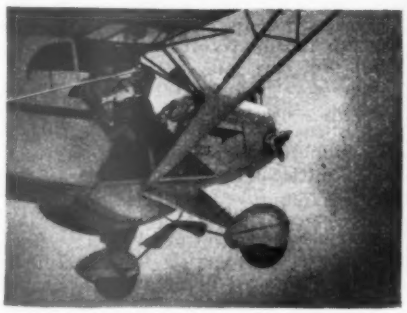
LENAPE "PAPOOSE"

SETS NEW LIGHT ENGINE

ENDURANCE RECORD



LENAPE "PAPOOSE" *50 H. P. radial engine, 138 pounds dry weight. Its smooth, dependable power and quick acceleration made the flight possible.*



Kress flying, Englert trailing rope for first refueling at Raleigh, N. C.

Half way! Loading up for return trip at 55 miles per hour, 36th Street Airport, Miami, Fla.

Before the flight—Pilots Kenneth Kress and Glenn Englert plot course of their Piper Cub with Captain Albert Duke of Eastern Airlines.

"WHAT an engine", said Kress as he landed at Newark. "Gas her up and she will do it all over again", added Englert.

"The 'Papoose' seemed to improve with every hour", they stated. "We took off with 1324 pounds in 17 seconds. At Jacksonville the load was at least 1370 pounds, yet we pulled up and away from the refueling car at 65 miles per hour. That's real performance."

* * *

Only 223 gallons of gas and 25 quarts of oil in more than two and a half days of continuous flying.

Full rated power when you need it—on small fields—at high altitudes—in warm climates—for flying boats—the "Papoose" shows the way.

Write for descriptive literature

LENAPE AIRCRAFT & MOTORS, INC.

P. O. Box 120, Matawan, New Jersey

He Showed 'Em

(*Continued from page 55*)

Thus, once more, King had conclusively proved that light seaplanes can do a great deal more than is generally expected of them.

His fifth and latest record was another airline distance record in the same tiny Aeronca in which he set the new altitude mark. "This flight," he said modestly, "was remarkable from the point of view of economy. I averaged 30 miles on a gallon of gasoline, though I did have a slight tail-wind to help me."

These flights have had the added significance of having resolved themselves into a sort of international game of tit-tat-toe between the United States and France for supremacy in aviation records, with Ben King waging the fight single-handed for the United States. When he started, France was three up, with 44 records to our 41. Since then the count has been up and down; first King would get one and then France. Once Italy put in her mark, taking one record away from France.

Asked if he wasn't impressed with the international significance of his achievements, Mr. King gave a deprecatory shrug, but then after a moment's thoughtful silence, he suddenly exhibited more emotion than he had shown during the entire interview. "It *is* a satisfaction," he admitted. "We hear so much about France's supremacy in the air, yet look—look what we have been able to do with ordinary stock models. All these planes I've used have been ordinary stock models—little Aeroncas. And it didn't even take our crack pilots to do it."

The latter part of that remark was typical of Ben King. He wouldn't dream of thinking of himself as a crack pilot, even after so impressive a series of record-breaking flights. Another man might have been suspected of false modesty after a speech like that, but not Ben King; he meant it. He's a quiet man, who seems to find it pleasanter to listen than to talk, though when he does speak it is with simple, unabashed directness which makes the thing he is describing seem clear and real and, above all, natural. He is a handsome man, too, though he seems as unaware of that as of the significance of his achievements. His hair is grey over a young face, and his eyes have the alertness of a bird's, though not the shallowness. Looking into them, they seem to lead into a great depth of co-ordinated wisdom, knowledge and experience.

The writer was impressed by a visit with King some time ago high up in a suburban Washington apartment. From his windows he had almost an airman's view of the Potomac valley and the Virginia hills beyond. It was a home that put you immediately at ease with its quiet good taste and livableness. There were books, deep chairs with convenient shaded lamps and a grand piano. No silver wings, cups or aviation trophies of any sort are visible, though Ben King has certainly won many of them. From a desk drawer, he produced the papers that certify his records.

"There's an awful lot of red tape to this sort of thing," he said with a half smile, exhibiting the thick pile of documents, each complete with seals and official-looking blue paper covers. "You have to get the Bureau of Standards down to weigh the plane, the United States Coast and Geodetic Survey to measure the distance and a lot of other things depending on the type of flight it is."

King was very reticent about personal questions, but he admitted that it would take a lot of figuring to estimate the number of hours he had spent in the air. "We didn't log hours in the air when I began flying back in 1911," he explained. "That is only since licenses have been required. During the war, I was in the air service but I didn't do much flying because they found out I was an engineer." He supervised construction of planes at that time and is still very much interested in design. "I like to poke around factories," he said with that half smile again that always comes with his disarming reluctance to discuss his personal tastes and accomplishments.

He couldn't seem to remember just when he had become interested in aviation. Judging from the puzzled expression that crossed his face in trying to answer that question, he must have been born that way. When he was a boy, instead of making racing cars from old baby-carriage wheels and packing cases, he built gliders and experimented with them on the snow-covered hills of Wisconsin. The system was to start down a hill on skiis or a sled, holding onto the cross beam of the glider with both hands. Then, when sufficient speed was attained, the glider would lift him off the sled or skiis into the air. "We cracked up a lot of gliders and had a lot of spills," he said, "but it didn't hurt much, falling into that deep snow."

Ben King does other things besides smash aviation records. "I earn my living, for one thing," he said with a humorous quirk in the corner of his mouth. "I'm an engineer." Besides, he takes an active part in aviation circles, having been governor and treasurer of the District of Columbia Chapter of the Sportsmen Pilot's Association and a member of the Quiet Birdmen. Also, he contributes frequent articles on aviation to magazines, and after a trip to Russia in 1934, branched into quite another field of writing and prepared an article on his impressions of the Soviet government, which was published in a newspaper.

His wife, fortunately, is as much interested in aviation as he is, though not so active. She doesn't worry unduly about his flights and loves to fly herself, although she does not hold a pilot's license.

Newspapers have called Ben King "The Flying Sportsman" and "The Sportsman Pilot". These are romantic titles and true as far as they go, but his interest in aviation is a great deal deeper than that of a mere sportsman. He flies for the love of it, but not for the thrills, and his fondness includes the whole industry and science of aeronautics. He wants no part of upside-down flights, but shoots straight for the mark to prove his point, whatever it may be. In short, he is a man whose influence should bring dignity, balance and wisdom to that great young giant—aviation.

END

METAL AIRCRAFT INSTRUCTION

Recognized by all leading manufacturers

course includes

CONSTRUCTION • **MAINTENANCE** • **SHEET METAL FABRICATION** • **RIVETING**

ENGINEERING • **REPAIR** • **ALUMINUM AND STEEL WELDING** • **ENGINES**

Prepare for rapid advancement by supplementing your high school or college education with a vocational training in AIRCRAFT WORK.

Get complete details of our fall class now forming by writing for our free folder, "OPPORTUNITY IN AVIATION"

LUSCOMBE SCHOOL OF AERONAUTICS

West Trenton • New Jersey

The Birdmen's Perch

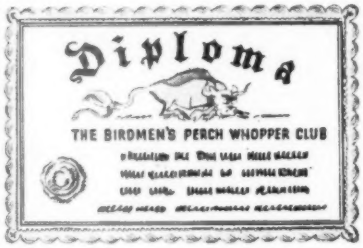
What-Happens-When-A-Bird-Flies-Into-The-Propellor Dept. There seems to be two sides to this question. One faction says it's good-bye to the prop and probably to the motor, too. The other claims it's just tough on the bird. To settle the argument, we'll take a vote. Shoot us a letter or a postcard with your opinion. *Quick . . . like a flash!* We'll try to print the result next month.

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

WHOPPER CLUB BULLETIN

Our Whopper Club is a mighty exclusive organization. Only 12 new members a year. Each one gets a Diploma especially printed with an illustration of his tall story. See sample.

Can't you just see the new-found admiration and respect in your friends' eyes at the sight of one of these on your wall? Better send in your weirdest yarn about Gulf Aviation Gas right away.



PUZZLERS—ATTENTION

Back last April we said something about inserting a really hard puzzle. Since that time letters have come in by the squadron daring us to do our worst. Now this is not the hardest puzzle we could make up but it *is* more difficult than the others.

In the triangle below, how many ways may GULFPRIDE OIL be spelled moving always at right angles? (The letters must be in their correct sequence.) A few of the ways are indicated on the triangle, to give you a start.

GULFPRIDEOIL
ULFPRIDEOIL
LFPRIDEOIL
FPRIDEOIL
PRIDEOIL
RIDEOIL
IDEOIL
DEOIL
EOIL
OIL
IL
L

GULFPRIDE OIL may be spelled . . . . ways.

(Mail your solution to T. W. T. to be checked.)

LIKE SAND IN SPINACH

You know how it is with spinach. It takes more than one washing to rid young America's favorite fruit of tooth-grinding grit and sand.

Same way with oil. If you're out to make the world's finest oil for planes, one refining process simply is not enough. That's why, in addition to conventional methods, Gulf uses the exclusive Alchlor process in refining Gulfpride. This *extra* refining removes as much as 20% *more* motor-gumming waste and sludge.

THIS MONTH'S WHOPPER

Dear Major:

I ain't sayin' you done it a-purpose but yore no account Gulf Aviation Gas is ruinin' my business.

Yestiddy a flyin' feller sets his airyplane down right in front of my dude ranch . . . out of gas. So I sends Pete, the hoss wrangler, to get some from town. While we're waitin', I'm cussin' out the prairie dogs fer diggin' burrows all over creation. And the flyin' feller says he's heard a little gas poured down the holes kinda' discourages 'em.

So when Pete came back with a drum of Gulf Aviation Gas and 3 brand-new dudes, I told him to try out the idee.

While he was doin' it, I took the dudes out riding. We're comin' home when I seen a big bald eagle in the sky. So I tells the dudes thet eagle is eight feet across and how he can carry off a sheep and maybe a calf. They was mighty impressed.

We was comin' up to the ranch house when we seen a prairie dog sittin' outside his burrow. I says thet's a prairie dog and there's thousands around. Just then the eagle musta' seen him, too, 'cause he came down with a rush right at the little prairie dog. But instead of divin' fer his hole thet blamed critter just squared off and jumped up to meet the eagle!

Wham! Old Baldy let out a screech like a catamount! Fer ten minutes you couldn't see nothin' but eagle feathers and an occasional bit o' hide along with 'em. Purty soon the dust settled and there was thet danged prairie dog settin' up on top of a dead eagle twenty times bigger'n he was!

Thet was enough fer my dudes! They took the next train East sayin' thet any place "ground hogs" could whup eagles was too tough fer *them!* The way I feel, Major, is that you oughta' at least warn folks what effects thet doggone Gulf Aviation Gas o' yourn is liable to have.

Pinto Bill Colihan

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

The DC-4

(*Continued from page 29*)

that will enable the reader to grasp the magnitude of the task of testing the DC-4:

The rear, or main, wheels stand five feet five inches in diameter, the single nose wheel slightly under four feet. Fuel tanks, main and auxiliary, hold 2,050 gallons of 100 octane (for peak engine performance) gasoline. Cargo compartments will house 6,500 pounds of baggage. The power-plant consists of four Pratt & Whitney 14-cylinder two-tow radial type *Hornets*, generating a cool 1,400 horsepower at take-off and spinning like light at 2,500 r.p.m.; geared to these motors are Hamilton hydromatic—quick feathering—propellers.

Both engines and props are dark Army-Navy secrets.

As we watched last May, Bureau of Air Commerce and factory men rolled the DC-4 ponderously onto three scales. She was empty of interior fittings, save for her flight instruments and some 8,500 pounds of special testing apparatus, and unfueled. Yet the monster weighed almost 50,000 pounds. Loaded to the limit, she'll weigh 65,000 pounds on scheduled service.

Tests won't end on the DC-4 for many a day. Until the final figures have been analyzed—and performance satisfies everyone from Donald Douglas down to the last engineer in charge of riveting—nothing will be released in the way of performance data. Yet, a fortnight ago, Douglas officials were confident enough in the transport, which has already cost more than $1,700.000, to predict that its ultimate cruising speed will touch 200 m.p.h. at 10,000 feet using 65 percent of total power. That's moving. And so is the great ship's top speed of 240 m.p.h. Service ceiling will be 23,000 feet—with maybe a few thousand more in a pinch.

Supercharged so that the cabin keeps a constant pressure equivalent to that found—between 10,000 and 12,000 feet, the DC-4 will eventually whip across America in 12 hours at 18,000 feet. Engineer Raymond had this to say about such procedure:

"We believe this transport . . ." and here he patted the DC-4 as though the gargantuan craft were a prized race horse—"will open up a whole new vista for air travel. Right now the airlines are using splendid equipment. It's more than adequate. But this craft looks into the future—or it *is* the future. Air transportation needs will embrace a ship that can operate day in, day out, summer and winter, without regard for weather. High above storms, the DC-4 will permit split-second schedules—always."

Bragging? Hardly!

Even before the Douglas No. 4 took to the skies, more than 600,000 hours of engineering and shop work had gone into her. She had been tested down to a gnat's eyelash. Fifty impact "landings" on her main gear proved that Major Cover could smack down into an airport with the DC-4 with a 240,000-pound *plop*. The nose wheel could withstand at least 54,000 pounds—probably plenty more.

In the 160 tests of this craft, Douglas experts discovered her approximate speed, ceiling, reaction to every conceivable weather condition. They buffeted every piece of metal that went into her; blasted the type of glass for the windows with sand; vibrated the fuel, oil and alcohol (for de-icers) tanks until their hypothetical teeth shook after 125 jiggling hours; and spent days mulling over the 5,835 feet of control cables and 21,000 feet of electrical wiring.

Every last rivet—and there are 1,300,000 of 'em—had the okay of every last inspector.

That, Douglas will tell you, is modern aviation at its finest. If he could have built a better airplane, he would have.

"Let's move wisely," says Douglas.

So here's how his men will move for the next few months; they will learn *all* the answers pertaining to their chief's pride-and-joy. They will try take-offs on three engines—just to see what would happen if one of the *Hornets* went dead as the transport lifted off an airport runway. (For that's a pilot's ever-present nightmare, especially on the present twin-engined jobs.)

They will dump liquid from the fuel tanks, aloft, to see what effect this load-lightening process might have on the DC-4. Not gasoline, but some comparable fluid, for the memory of Capt. Ed Musick and the ill-fated *Samoan Clipper* still bulks big in transport aviation's mind.

One testing gadget will reach tentacles into the farthest corners of the cabins and wings to determine what percentage—if any—of carbon monoxide gas wafts back from the quadruple power system. Another gadget—a "rat"—went on the wings at the request of California's Institute of Technology. This will tell scientists exactly where and why air giving the *lift* starts turbulating over the wing.

One propellor hub has been wrapped with wire, connected to a sensitive instrument, to disclose to the Nth degree the wobble of the spinning, triple-bladed mill.

That is slide-rule flying. It shows that aviation doesn't sit on a chair and hope for the best any longer. It shows, too, that the days of the piano wire and butcher's paper wings and paint-and-prayer bodies have ended. Forever, happily!

As I walked around the DC-4, gazing up at its seemingly endless expanse of tail, fuselage and wing surface, where the experimental insignia NX-18100 had been painted blackly in symbols so large one looked twice to see all of them, I learned these things:

That the two outer engines aimed outward and downward slightly. Yes, said the official, this was true. They point outward just 2.5 degrees, so that if two motors on one side quit, the powerplants on the remaining side will blast their hurricane slipstream directly at the triple-tail. More control. For the same reason their great, blunt noses are slightly depressed—thus directing their airflow more strenuously against the wing.

That the nose of the DC-4 isn't duralumin, like the rest of the ponderous craft. It is laminated wood and fabric. In here are housed the rotable antennae for the ship's many-faceted radio equipment. It will be an experiment to test whether such an enclosed hood will make for better reception.

What would happen, I asked, if the DC-4, coming in for a landing, suddenly lost her nose wheel through mechanical trouble? That one was easy. The pilot would land her like her "little" sister, the DC-3, by making a contact with the main gear and the husky metal welt beneath the tail surfaces. The big craft's landing proclivities, engineers were certain last month after initial tests, prove at least this:

That immediate worry of airport operators can be stilled. She pancakes into a 'drome at an unusually steep angle for so large a plane; much like a monstrous edition of a Waco three-wheeler or a Stearman-Hammond. Then the brakes take hold—right now!

Thus with the latest and greatest of the Douglases, another month and a half—at least—of company testing remains for the world's No. 1 landplane. Then each of the five participating companies will receive her for their own, specialized guinea-pig maneuvers. For 60 days the crack pilots of each transport firm will familiarize themselves with the ship. And by next year production will start. No company will operate a DC-4 on schedule, however, until each airline filing an order (at about $400,000 apiece) gets one plane.

So until next year, from the shores of the Pacific at Santa Monica, the cry is: "*Hasta la vista!*"

END

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Reflecting the greatest engineering effort ever directed to building a vehicle for land, sea or air, the DC-4 takes its place as Sovereign of the Skies. With new comfort, speed and safety, for 42 passengers and crew of five, this world's largest commercial land transport represents the pooled experience of Douglas and five major airlines. Douglas Aircraft Co., Inc., Santa Monica, Calif.

DOUGLAS

UNITED AIR LINES . . . TWA . . . AMERICAN AIRLINES, INC . . . EASTERN AIR LINES . . . PAN AMERICAN AIRWAYS

"So I took the $800,000,000"

(*Continued from page* 44)

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EVEREL

40 H. P.

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Make money . . . save money with Aviation's newest development.
Now available up to 150 horse-power.

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MUNSEY BUILDING, BALTIMORE, U. S. A. Cable: EVEREL

Airy Chat

(Continued from page 9)

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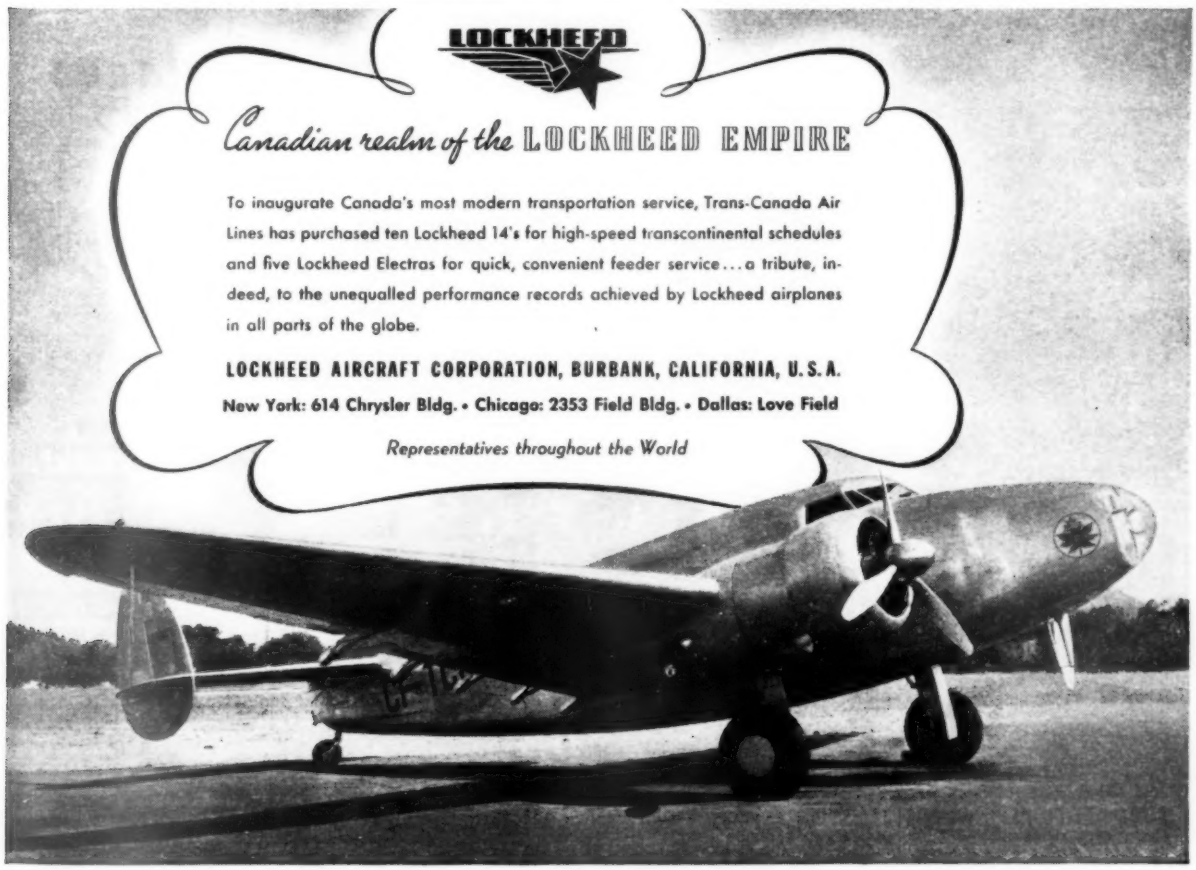
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(*Continued from page 44*)

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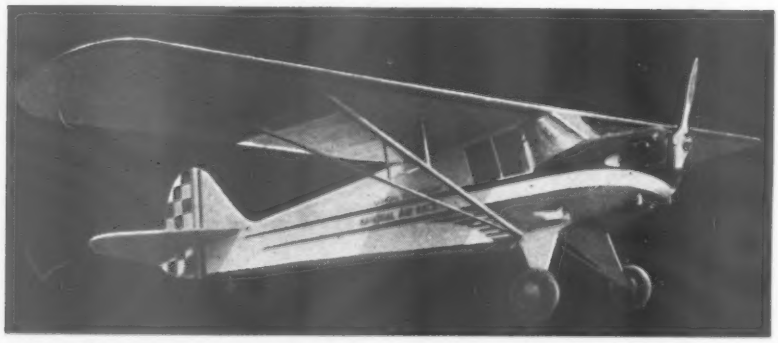

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Clear and Unlimited

(*Continued from page 63*)

down here. They have very few minor automobile accidents—all major ones. One thing, though, they really make the buses stay close to the curb so that the taxpayers don't have to play second fiddle to the common carriers. . . . The breathtaking beauty of the flowering trees on the mountain sides. Wonder why the girls in Rio don't do more hiking up and down the hills. If they did their stems wouldn't look like II, they would look like this ! !

The quiet dignity of the Brazilians. They like to be in or on the water and little else. Politics, or political squabbles, are of no particular interest to anybody except those who are trying to get into power . . . The beautiful Organ Mts. back of Rio with the Finger of God pointing the way to Petropolis in the heat of summer. People run for the mountains in the hot weather like they do in Denver. . . . The view from Sugar Loaf at sunset when Rio puts on her necklace of waterfront lights. Makes your heart do outsides loops and your brain slow-rolls. . . . The first time you see the big black and yellow butterflies flap in and out of the French window of the Gloria dining room at lunch time you feel transported to a world of fantasy from which it is hard to return. The same thing holds true when you see the Southern Cross rise on its side behind Sugar Loaf . . . And when you sail out of the harbor at dawn this same glorious Sugar Loaf covers her head with a misty veil to keep from seeing you go. Just about then you begin to understand what this thing is called heartbreak.

Ao Banderia Brazilerian!

Ducky Stuff . . .

Wish the Bureau of Air Commerce and the Bureau of Standards would sort of get together on how to keep ducks out of the cockpits. The B. of A. C., I understand, says that henceforth all manufacturers will provide 5-ply laminated glass in windshields 3/8 in. thick. While the Bureau of Standards says that a 3 lb. duck moving at 40 m.p.h., striking an airplane windshield head-on would need a 12 in. thickness of glass to keep the dead amphibian from penetrating the windshield.

It is just one of those little discrepancies which arise from time to time to harass and annoy an Industry more harassed and annoyed than any business group in American history including bottleggers and the counterfeiters.

Maybe, before this issue of your favorite publication sees the light of day, a kindly Congress will already have remedied the insufferable conditions in the BAC. I for one doubt it in the welter of politics now going on in Washington. I am afraid that they won't have time for us in this session. If not, and I hope I am wrong, we have got to put our faith and trust in Denny Mulligan. He, if anybody in the world can navigate a pesky craft for a greenhorn skipper, can and will run a good, honest and workmanlike Bureau of Air Commerce.

A Lotta Scud . . .

Returning from South America it was a joy to see the Aircraft Year Book For 1938 on my desk waiting for me. Howard Mingos has done the usual superb job of presenting all the useful information in palatable form. Read pages 17 and 18 and sit down for a chat with your congressmen by mail. It is awfully important that you do if you don't want to see this country drop behind in aircraft development . . . Just to keep the record straight: Not only is the Sperry Gyropilot an invaluable aid to navigation but it is a moneymaker for the airlines. On each trip between Dallas and Los Angeles, for example, it saves nearly a hundred dollars worth of fuel . . . There is a grand scrappy organization, with headquarters out in Eugene, Oregon, who have had the gumption to tell the government that it is working for us, not we for it. The Private Flyers Assc. is that scrappy outfit and it deserves your support. If you fly now, or ever hope to fly your own ship, get in with a regular bunch of Americans and help fight for our losing cause. The dues are only $3.00 per year and you'll get dollars for cents what you put in. Hurry now . . . Travel Note: The next time I go to sea it will be under the American

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flag. Might better put up with inferior servants than the snobbery of British merchantmen officers. Besides, British seamanship is a vastly overrated commodity; remember the *Titanic*, and the *Vestris* to name a couple?

It was pretty swell of Pennsylvania-Central Airlines to turn around and share the credit with General Tire & Rubber Co., for their "Award of Special Commendation," by the National Safety Council. In a letter to Ray Brown the P-C A super of maintenance, Luther Harris, says in part, "Please accept our appreciation of your assistance in making this record possible . . ." Health Note: There is one advantage of being hit with appindecitis while crossing the terrestial equator. They melt about twelve tons of crushed ice on your tummy—and, s'help me, it's the only cool spot on the boat.

END

A Town Goes Flying

(*Continued from page 26*)

ment-approved school, basic equipment for required medical examinations is being developed and installed. Students have already made the apparatus for a depth perception test with frosted glass, bulbs and sockets garnered from home workshops. The control box is the product of parts of an ancient radio set with pulleys made of scraps of bakelite. The medico air enthusiast has donated equipment for testing diplopia. When the fireman—also a radio bug—had his day off he fixed up a set so they can get radio reports and the radio beam at headquarters.

Probably the most hopeful students in the aviation school are those smaller youngsters who aren't yet old enough for the ground classes or flying and have to confine their activities to model plane building. So good are they at it, however, that their scale models of representatives types of planes from the first primitive model of Langley's "aerodrome" built in 1903 to the latest Benny Howard racer were placed on exhibition at the Chicago Historical Society. When the measurements for the historical models are not available the students reconstruct the facts for themselves. A picture of the plane with a man beside it is secured and dimensions estimated from the average height of men of that time in the country where the plane was constructed. Actual flying conditions are provided for tests in a wind tunnel built by the pupils themselves.

Even these youngsters can't be kept on the ground and most of them have been up at least once. To date about 800 children and about 350 of their parents have been given rides in the *Cub*.

One of the snappiest and proudest units in the village Memorial Day parade was the aviation school group. For the first time this year they had a chance to sport on dress parade their snappy uniforms. The boys wore their regulation Army shirts and slacks and the girls their white shirts and skirts and snappy red ties.

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Our Flight to South America

(*Continued from page* 12)

huge silver outlines of six *Flying Fortresses* catch the moonbeams at intervals to vie with the increasing number of lights now twinkling from cabin windows and portholes. Al Hansen, state aviation official and manager of the local airport, is bustling around, helpful as usual and placing ever facility at our disposal. The faithful, ever watchful Department of Air Commerce weather and traffic station has given us their latest weather information to the south, the position of all air traffic along the Florida airways and in turn we have filed with their office our flight plan for the take-off and the few miles to follow in the vicinity of the Miami-Key West airway. Everything is in readiness. We receive a handclasp and a farewell word of encouragement from our commanding general, Major-General Frank M. Andrews, and the order is given:

"Start engines."

It is now 12:30 a. m., February 17, 1938. Major McReynolds, my engineer-pilot in No. 10, has completed his inspection; all engines are running; the ship is ready to go. Lieutenant Egan, the group navigator, reports all in readiness. Lieutenant Tucker has tested our radio and is in communication with the temporary Air Corps radio ground station at Chapman Field, Florida. We call the roll over the interphone. Everyone is aboard and at duty stations. We shift over to our command short-wave radio to see if the other planes are ready to go.

"Olds calling all planes—check in."

Meloy in 51: "O.K."

Harding in 52: "O.K."

Haynes in 80: "O.K."

Smith in 82: "O.K."

George in 61: "O.K."

Olds to all planes: "Follow me at three-minute intervals. Report in turn when in the air. Use normal cruising data for 12,000 feet. Guard 6230 kilocycles continuously for command purposes. Acknowledge."

No. 51: "O.K."

No. 52: "O.K."

No. 80: "O.K."

No. 82: "O.K."

No. 61: "O.K."

Automatically, each airplane commander and his engineer-pilot now shift to interphone (the telephone system connecting all persons aboard) and go over the check list which insures that no important item is overlooked before we taxi out to take-off position

"Wow! Sergeant Blotz is having another nightmare!"

Let's peep over Major McReynolds shoulder during this check list formality. It may disclose one of the reasons why Army methods have obtained eminently successful results in thousands of hours flying operations with our *Flying Fortresses.* We see a six-by-eight card with each item properly printed and numbered in logical sequence. Each pilot and co-pilot call off, check visually and physically every item listed to be doubly certain that nothing has been overlooked to insure the safe operation of the plane.

Twenty-four engines are now idling at closed throttles, giving little or no indication of the 24,000 hp. ready to be unleashed at the slight forward movement of the six quadruplicate throttles. Flashes of moonlight reflect, twinkling from the revolving propellers. Coral packed runways are clearly defined; no floodlights will be needed. The peaceful quiet of a semi-tropical night is suddenly broken. Flagship No. 10 with a mighty roar from its four powerful engines is on its way to the take-off runway. Each succeeding ship follows in column at 300 foot intervals. A momentary pause to test each engine and lock tail wheel, and it's "Good-bye Miami! Hello, Buenos Aires!"

We are in the air at 12:45 a. m., February 17, 1938. Destination: Buenos Aires. First stop: Lima, Peru.

Fleecy, scattered cumulus clouds at altitudes from 4,000 to 10,000 feet cast a faint shadow over Miami and the Florida keys in the moonlight. All ships are in the air and have reported "On course." Although out of visual range of each other, the report assures us that the individual navigation of each plane is accurate and that all planes are where they should be in supporting distance of each other.

Within a surprisingly short time, we broadcast from No. 10:

"Over the north shore of Cuba."

Each airplane commander in the group repeats the same information as his plane passes over the shoreline. South of Cuba the cumulus cloud formations rear their heads to 14,000 or 15,000

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feet in altitude. We are fairly heavily loaded, and avoid these vertical castles in the air as far as possible only because of the turbulence we know that lies within such nocturnal grandeur.

Our navigators are so absorbed in their problems that each slight deviation from our true course to avoid these turbulent conditions produces a groan from the chartroom. They are an amazing manner of men, preferring to take the bumps to any deviation from course. At last we humor Lieutenant Egan and penetrate a relatively small cumulus head. After the maps and a few instruments are gathered up from the floor of the airplane on emerging from this cumulus formation, we hear no further groans from his direction during the remainder of the trip.

Cuba now lies astern. We are over the Caribbean. As a result of our three minute interval between individual airplanes at the take off, we are spaced approximately 10 miles apart. All airplanes are equipped with navigation instruments adequate to meet our requirements for both celestial and dead-reckoning navigation over land, sea or fog, and each of the six navigators must solve his individual problem and arrive at destination, on course and *on schedule*.

Hourly position reports are being transmitted to Washington and Langley Field where the progress of our flight is being plotted accurately as long as we are in the air. It is comforting to know that higher authorities are also on 24-hour duty ready to spring into action should an emergency arise.

The first gray streaks of dawn should find us over Panama. Clouds are thickening, and the surface of the sea is becoming somewhat obscured by haze. We are at 14,000 feet consuming coffee and sandwiches. A short distance ahead the cloud formations brightly illuminated in the moonlight appear ghostlike in their resemblance to high mountain ranges. The sky brightens with the coming sun A small hole in the cloud formation appears downward and to the left of the nose of our flagship. We see Gatun Lake in the Panama Canal Zone, are within five miles of our first navigation check point, and have passed over within two minutes of Lieutenant Egan's estimated time of arrival.

Our planes are comfortable, engines and accessories are functioning smoothly, and we could have no greater confidence in the efficiency of our crews. So when we learn from Panama that severe tropical disturbances are raging along the coasts of Colombia and Ecuador, we fly on toward our objective, confident that our equipment can return us to Panama if reported conditions are impenetrable. As we leave Point Mala behind it is broad daylight and, for the time being, the weather is clear. This gives us an excellent opportunity to take a double drift to recheck our actual ground speed. Within a couple of hours, the weather thickens, and we are at 12,000 feet above solid overcasts, which rise with increasing rapidity as we near the equator.

Weather reports from Buenaventura, Colombia, Tumaco, Colombia and Guayaquil, Ecuador, are not encouraging. Low ceilings, low visibility and heavy rains have been reported since daylight. Each member of our crew has been provided individual oxygen equipment. We now put it to use.

With the rising of the sun, vertical air currents in the storm area boil the overcast up to our flying altitudes with the speed of an express elevator. We have been an hour at 20,000 feet, and the overcast appears still higher ahead. One or two of the crews elect to remain at a slightly lower altitude where they find a limited space between layers of clouds. Soon however, the layers merge, and they report "on instruments" which means "flying blind."

We radio to Panama: "Proceeding on to Lima—weather permitting." The situation is tense. Enough real drama is packed into a seemingly endless hour to tame all other events of a lifetime. Forty-nine souls in six air monsters left Miami with but a single thought: "ON TO LIMA."

We may be *thrown* back out of this tropical disturbance, but will not *turn* back!

"Olds to all planes. One zero now 21,000 feet. Just on top of overcast. Still climbing. High cumulus to left and ahead. Appears lower and clearer to seaward. Report positions in turn."

"Five one; 20,000 feet, climbing. Same conditions."

"Five two; 22,000 feet. Same conditions."

"Eight zero; 16,000 feet. Now between layers. Appears better to seaward."

"Eight two; 18,000 feet. On instruments same course. Turbulent."

"Six one; 19,000 feet. On instruments, same course. Turbulent."

"Olds all planes. Change course 45 degrees to right for 30 minutes. Better conditions expected to seaward. Acknowledge."

All ships acknowledge and execute change in course as ordered. It is the rainy season in this equatorial area and we expected anything but fair weather. However we were not prepared to admit that any storm could rise vertically at a higher rate of speed than we could climb. We lived and learned, hence our maneuver to seaward to circumnavigate the center of the disturbance.

Conditions do not change for the next 15 minutes. Then, as if in direct answer to a bit of a prayer: "Weather report—Talara, Peru—low clouds all directions except clearing to northwest."

If you could ever inherit a million dollars *that* news would be no more welcome than the Talara weather report was to us at this time. Although some 500 miles to the south of our present position, it gave us an out and that was what we needed most to continue on to Lima. (*Continued on next page*)

DON'T MISS

The important scoop in our next issue! Frank G. Tinker, Jr., Yankee airman who flew in Spain for more than a year, tells all about the latest foreign ships he fought with and against! Watch for this exclusive feature in the September issue of POPULAR AVIATION

Do You Know . . .

. . . THAT the U. S. Navy Department has ordered an additional 58 Curtiss SBC Scout Bombers, all powered by Wright Cyclones, for use aboard aircraft carriers of the U. S. Fleet.

. . . THAT the development for the export market of an interceptor fighter, reputed to have a top speed of over 300 M.P.H., is under way in the St. Louis Airplane Division of the Curtiss-Wright Corporation. The ship under construction, of the all-metal low-wing type, will be powered by a 1000 H.P. Wright Cyclone equipped with a two speed supercharger. Performance figures have not been divulged, but in addition to exceptionally high speeds at both sea level and high altitudes, the ship will have an unusually fast rate of climb.

. . . THAT 24 new Seversky Convoy Fighters, powered with 1000 H.P. Wright Cyclone engines, are rapidly taking shape at the factory of the Seversky Aircraft Company, Farmingdale, Long Island.

. . . THAT the first of a fleet of 3 trimotored Cyclone-powered Savoia Marchetti S-83 airliners, purchased by SABENA, Belgian air transport company, was flown from Milan, Italy, to Brussels, Belgium, where it will be given an exhaustive series of service tests. The new Italian-built, American powered, trimotor will operate between Belgium and Belgian Congo, carrying 10 passengers at a top speed in excess of 260 M.P.H.—cruising speed of from 225 to 235 M.P.H.

. . . THAT the largest airplane ever built in America, the Boeing 314 for Pan American Airways, is powered by four 1500 horsepower Wright double row Cyclones.

. . . THAT the 41½ ton Boeing Clipper has an aggregate of 6000 H.P. developed by its four Wright Cyclones, an estimated top speed of 200 miles per hour, and a total cruising range of 4,000 miles.

. . . THAT the huge clippers have comfortable sleeping quarters for 40, or day travel accommodation for 72 and will speed over Pan American routes from New York to London, and on their Pacific routes from California to Honolulu, and from Honolulu to New Zealand.

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Our Flight to South America

(*Continued from page 83*)

"Olds all planes. Weather clearing northwest Talara. Hold present course until break through, then lay course on Talara on top."

Then follows an uneventful, though interesting, portion of this leg of the flight across the coastal desert areas of Peru to an assembly of the six planes over Point Salinas, from whence we proceed to Lima and arrive over the town at 3:20 p. m. For the next 40 minutes we circle and maneuver in formation finally landing on the Limatambo airport at 4:00 p. m.

Before we came to rest the American and Peruvian flags are run up side by side over the control cabin hatch of each airplane. Huge throngs cheer a lusty greeting from the spacious airport enclosures adjoining the Panagra airway station. Uniformed attendants flag us to parking spaces. The Peruvian army is on hand to guard our ships during our brief visit for fuel and food.

The American ambassador, Mr. Steinhardt, his staff, and many high officials of the Peruvian government are on hand to greet us as we set foot aground. Immediately following these pleasant formalities, we conduct the usual pre-flight inspection of aircraft, and start refueling for the next leg of our trip. Although we have not slept for 36 hours, there is little evidence of fatigue. A delicious supper is served in the airport café, after which we call a conference of all airplane crews and study weather reports for the remainder of the journey.

It is now 10 p. m. February 17. All planes are refuelled, although the weather is not particularly favorable. Reports indicate low fog banks which we can see hovering closely to the south in the path of our take-off. They also indicate a solid overcast above the fog extending probably to 8,000 or 10,000 feet in altitude. An uninviting hill about eight miles in length and 1,200 feet high is located most inconveniently about four miles to the south of our airport directly in line of flight. The Andes rise to many thousands of feet to the left of our course. All in all, conditions are not too favorable for a take-off unless equipment and personnel are in the pink of condition.

For the last four or five hours of flight into Lima, one of the propeller governors on Major Meloy's ship No. 51, has gotten out of adjustment, which produces a lack of synchronization in the functioning of the particular unit. Efforts to remedy the difficulty have not been completed up to this time, therefore Major Meloy and his crew are directed to continue work on the faulty governor, leave Lima at daylight, February 18, and rejoin the group at Buenos Aires before dark.

"Stations—10:30. Take-off 10:50, three-minute intervals."

We are loaded as usual to full capacity, but clear the temporary road lights at the south end of the airdrome by a good 100 feet, followed by a 30° turn to the right to head out to the sea and avoid the young mountain down to the left. On instruments for a few brief seconds, and then a steady climb to 4,000 feet where we enter the overcast. Each succeeding plane reports "O.K." as the airdrome is cleared. My ship breaks through on top of the overcast at 7,000 feet, and relays that information to the succeeding planes.

Above, a high, thin overcast obscures the stars, but the outline of the moon is observed dimly at all times. We lay our course for Antofagasta, Chile, planning to continue thereafter down the coast of Chile in order to execute our crossing of the Andes in daylight hours. When within 60 miles of Chile, a shimmer of silver appears far ahead. Its message is translated:

"Overcast dissipated, clear skies in the distance."

In a comparatively few minutes, we sight a small light directly over the nose of the flagship. It grows gradually into Antofagasta.

Drowsy relief. "Sergeant Boutty, please send a thermos jug of coffee up to the control cabin." Relief crews now take over for the next two hours. Fog is rolling in over the coastline, while the snow-covered peaks of the Andes shine in the moonlight to our left.

Our maps for the most part are coastal charts which show little or no detail inshore. From Valparaiso on to Buenos Aires, however, we have sectional charts which are somewhat better.

A golden glow appears to the east which silhouettes in all its exquisite grandeur the white mantled majesty of the Andes. To view this masterpiece of nature from an altitude of 15,000 feet in the crisp, clear air of a Chilean early morning creates an indelible impression which time can never erase.

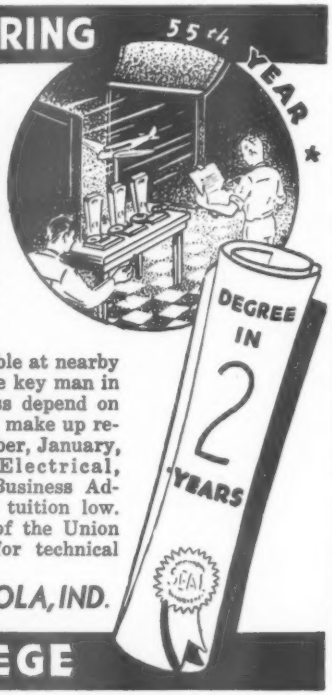
The pass between San Felipe, Chile, and Mendoza, Argentina, is clear and unlimited. We cross, between snow-capped peaks that touch the heavens at 23,000, at a flying altitude of about 18,000 feet and directly over the world famous statue of the Christus on the Argentine-Chilean border. From Mendoza to Villa Mercedes we pass over or circumnavigate countless cumulus heads indicating at this time the incubation of thunderstorms to follow over the Pampas. We pass out of the cloud area at Villa Mercedes, and penetrate a fairly severe dust storm until Junin is reached.

"Olds calling all planes. Assemble at 4,000 feet over Mercedes, 40 miles west of Buenos Aires."

It takes less than 12 minutes to complete the assembly over Mercedes of five airplanes, each of which has just flown over 2,250 miles from Lima, Peru, without having seen one another during any part of the journey.

We are over Buenos Aires at 11:05 a. m., February 18, and maneuver in formation until our landing is accomplished at the El Palomar airdrome at 11:30 a. m. Our first impression of Buenos Aires is unforgettable. Its many beautiful buildings, clearly visible from the air, stretching over a vast area dotted with parks rich in foliage, lined with broad streets, and studded with many

AERONAUTICAL ENGINEERING



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circles. The broad Parana river is in the distance with a neatly-planned city waterfront in which countless ocean liners are docked. We are absorbed in the beauty of Buenos Aires from the air, but much to our consternation we notice the unfamiliar left hand automobile traffic weaving along the streets and highways. This left hand traffic is to give us many thrills during our stay in Buenos Aires, of which at present we are totally unaware.

We taxi up to the hangar line at El Palomar flying the flags of the United States and Argentina, and meet the American ambassador accompanied by Mrs. Weddell, his staff and high officials of the Argentine government. Colonel Manni, acting chief of the Argentine Air Force, is our host in the Officers Club at El Palomar for refreshments. We are guests of the government at the Alvear Palace hotel. Our mechanics and radio operators are guests of the Argentine Air Force at El Palomar.

That evening word is received that Major Meloy in ship No. 51 left Lima at daylight to rejoin the group. He is due in shortly before dark. Major Eugenio Cormach Lynch of the Argentine Air Force, who has been detailed to me as adjutant-aide during our visit to Buenos Aires, is now on the telephone. The El Palomar airdrome has called and reports a 65 mile-an-hour gale with considerable dust, followed closely by a violent thunderstorm.

Our communications from air to ground and vice versa are with Panagra. Their field is within 15 miles of El Palomar. We telephone Panagra and select certain alternate destinations for Major Meloy where the weather is less severe. He is kept informed constantly of conditions at Buenos Aires. Upon his arrival the full force of the disturbance has not been spent, but fortunately it has not extended more than 30 miles west of Buenos Aires. After an hour, he lands at El Palomar in a severe rain, but without difficulty, and rejoins his group before dark of the second day out of Miami, Florida. In doing so he has accomplished a brilliant flight at high altitude, diagonally across the heart of the Andes from Lima to Buenos Aires. We wanted our record complete and left it up to Vince Meloy. He came through as expected.

In the early part of the evening I, as group commander, am escorted by the American ambassador to the home of President-elect Ortiz, where a letter dated February 16 from the President of the United States is presented on February 18 to the President-elect of the Republic of Argentina . . .

On February 20 we take to the air with our six *Flying Fortresses* and once again are over Buenos Aires leading a large formation of airplanes from the Argentine Air Force over the inaugural parade in honor of their new president.

As we take stations at 6:45 a. m., E.S.T., February 22, preparatory to the relative short flight to Santiago, Chile, we are truly sorry to leave so many new-found friends so soon. Their cordiality and hospitality has been sincere. We have felt individually and collectively that the attitude of the people of Argentina has reflected through us a genuine affection for the people of the United States. As individuals we can only say that nothing would give us greater pleasure than to be able at some future date to reciprocate their hospitality.

An unnoticed, lightly reinforced manhole cover on the edge of the concrete ramp in front of the hangars at El Palomar has caved in slightly under the weight of the right wheel of No. 82. Heavy jacks are not immediately available. This will delay the take-off of Captain Smith, who is directed to rejoin the group at Santiago as soon as possible.

We leave at 7:05 a. m. on a beautiful, clear day with unlimited visibility, and are thus afforded an opportunity to gain our first unobscured view of the verdant country to the west of Buenos Aires and later the famed pampas. Within three hours we can see the snow-capped peaks in the vicinity of Mendoza, which rear upwards to 23,000 feet. Our five planes assemble over San Felipe, proceed to Santiago and maneuver until we land at noon, February 22.

The American chargé d'affaires and Mrs. Frost, his staff, and high officials of the Chilean government, are at the Los Cerillos airport to greet us as we land. As had been the case of Buenos Aires, the American embassy takes di-

(*Continued on page 86*)

★

I fought in Spain

by

FRANK TINKER, Jr.

Here's a real scoop scheduled for the September issue! The author was a fighting pilot in Spain for more than a year. He also wrote the series of *Saturday Evening Post* articles and the book, both entitled "Some Still Live". His exclusive POPULAR AVIATION article discusses intimately the types of modern warplanes and pilots he fought with and against. Don't miss it in the

SEPTEMBER ISSUE

POPULAR AVIATION

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Our Flight to South America

(*Continued from page 85*)

rect charge of our official and social schedule which is strictly adhered to.

Captain Smith in No. 82 rejoins the group before dark.

As we prepare to take off for Lima at 7:45 a. m., February 23, minor trouble develops in one of the engine starters on No. 82. Captain Smith reports over the radio it will take approximately two hours to remedy his difficulty. He is directed to clear Santiago as soon as possible and be prepared to remain overnight at Arica, Chile, in view of the fact that night landing facilities are not available at Limatambo airport in Lima.

We clear at 7:45 a. m., with good weather prevailing in the immediate vicinity of Santiago. Within 25 miles to the north, however, the fog covers the sea as far west as the horizon, and is poking its eerie fingers well into the valleys of the Andes. We sight Arica in mid-afternoon through a clearing in the overcast, and are then back over a cloud-covered sea almost immediately thereafter, with considerable static crackling in our ears caused by a continuous line of storms raging over the Andes to our right. Weather at our destination is unsettled, but we have sufficient range to proceed on beyond to the arid areas of Peru well to the north of Lima in case of landing difficulties at our scheduled destination.

At a point some 150 miles south of Pisco, Peru, the weather begins to thicken. It looks as though we may have to go underneath to get into Lima, as at no point south of Miami have we had the advantages of radio range stations such as permit our aircraft in the United States to let down "on instruments" through overcasts at destinations. Accordingly, we drop down from 10,000 feet to about 200 and continue for some 15 or 20 minutes flying contact along the shoreline, where the cliffs are half bared in fog and clouds. This is not too comfortable, so we gain altitude to 6,000 feet and continue between layers until our calculations indicated that we should be 10 miles off the de Paracas peninsula immediately southwest of Pisco. We then change courses for Lima, and arrive on schedule with a good ceiling of 4,000 or 5,000 feet. Our assembly is accomplished over the city of Lima at 4:45, followed by a landing at 5:10 p. m., February 23.

Our same friends greet us at Lima on our return and, as we had found in both Santiago and Buenos Aires, the hospitality and courteous consideration to all personnel of the Good Will Flight leaves absolutely nothing to be desired.

Captain Smith in No. 82 reaches Arica before dark and rejoins the group at noon, February 24, at Lima where all airplanes are being thoroughly inspected and refuelled for the return flight to Panama.

At 6:00 a. m. February 25, our six Good Will *Flying Fortresses* leave Lima for Panama. We encounter a solid overcast at 3,000 feet, break through on top at 7,000, then on up to 12,000 where we set course for Panama. The clouds remain solid beneath us, although we are able to take constant observations of the sun. A few small breaks in the overcast appear ahead, and as we pass over, we recognize Talara. None of us know what Talara looks like on the ground, but from the air it is truly a friendly port, an invaluable check point on both our southbound and northbound flights. As if accomplishing its mission to our complete satisfaction, Talara again becomes obscured by additional overcasts we encounter to the north, and we feel as though we are saying goodbye to a good, loyal friend in need.

Later on we find a limited area of scattered clouds over Point Elena on the coastline of Ecuador, due west of Guayaquil. This provides another good check point to confirm our calculated ground speed.

Tumaco, Buenaventura and Salano, three Panagra stations on the west coast of Colombia, now report tropical rains, but Panama is open. We climb to 16,000 feet over top of the persistent equatorial overcast and glide along smoothly into Albrook Field in the Panama Canal Zone, where many old friends in the Army and Navy are on hand to greet us. We remain at Albrook Field overnight to permit many of our brother officers an

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opportunity to inspect the *Flying Fortresses* on their first visit to Panama.

At 8:05 a. m., February 26, we are hardly in the air before landing gears are lowered to come to rest on France Field on the Atlantic side of the Canal Zone where mechanics will assist us in conducting a routine 40-hour inspection, and in the refueling of our planes for the last leg back home.

We have planned a return trip by easy stages and shall probably spend the night of February 27 in Miami, our starting point. We learn, however, we are due to participate in Wing Maneuvers in Florida in the very near future, and our vacation in South America is practically over. We therefore order full service and stations at 5:30 a. m., February 27. We are to link by direct nonstop flight the Panama Canal Zone with the key air base of the GHQ Air Force, Langley Field, Virginia.

It is 6:10 a. m., February 27. The wheels of Flagship No. 10 are well over the lights at the end of the north-south runway on France Field. We are told to expect 25 to 30-mile head winds up to 12,000 feet. Above that altitude these winds should diminish slightly. All planes are off, loaded to full capacity as usual. No one uses more than two-thirds of the available runway to get into the air. We climb to 13,000 feet, hit the south coast of Cuba directly on the nose at a point half way between Trinidad and Cienfuegos. Then the city of Miami affords our first glimpse of Florida.

Continuing on course, we proceed to a point 375 nautical miles north of Miami well off-shore in order to give our navigators a final opportunity to take a series of running shots on the sun. These shots check accurately with their dead reckoning navigation which guides us on our new course to the exact spot we expected to reach for our first land contact near Charleston, South Carolina.

"Olds calling all planes—assemble at 4,000 feet over Norfolk, Virginia."

As had been our pratice in accomplishing all assemblies, the flagship circles to the left, all others to the right. If the flagship is delayed time is not lost attempting to assemble on the wrong airplane. All six ships are in formation within 10 minutes after the first plane arrives over Norfolk, this being the first time we had seen one another since the take-off at France Field although at no time were we unable to maintain voice communication between planes.

We maneuver in formation over Langley Field for nearly 30 minutes and land at 5:00 p. m., February 27, having traveled over 12,000 miles in less than seven flying days. As we taxi in, in excellent health and spirit, in the best airplanes of their kind that have ever been built, and with engines that have purred sweetly and continuously without a single miss, we find the entire garrison on hand to meet us. It does not seem real. It is one of those experiences we have each dreamed of for many years . . .

We are now lined up in front of the flagship. The commander of the GHQ Air Force is reading the latest congratulatory telegrams from the Secretary of War, the Chief of Staff, and the Chief of the Air Corps, whose confidence in our Army from the very start made the Good Will Flight a possibility, and whose intimate interest in our progress greeted us at every stop. We are all a little deaf from the constant throb of the engines, and the higher altitudes at which we have been flying, and are missing a few words of the messages, but we'll never forget the gratified smile of greeting we received from the man whose continued radio messages of encouragement throughout the entire trip had kept our spirits keyed to the highest pitch and whose personal piloting has been an incalculable inspiration to all aviators under his command: Major General Frank M. Andrews.

And so to bed, for there's more work to be done tomorrow.

END

The opinions expressed herein are those of the author and are intended in no way to reflect the views of the War Department or of any of the officers in the military services.

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America Need Not Be Vulnerable

(*Continued from page 34*)

what it is, would in all probability flounder about on the outer fringes of the attack area releasing their missiles on points that in *their opinion* are more important than those originally selected by their superior officers.

This is the human factor most mathematical-minded theorists ignore. We who have been through these experiences know there is far more to a bombing raid than the range of action, cruising speed and the penetration effect of the missile dropped. The same human element is evident also in the anti-aircraft crews, but not to such an extent. It is one thing to be frightened or shall we say "under tense emotional stress" in the air, with shells crashing all about you—and quite another to be engaged in a great game of "duck-hunting" with a three-inch gun against all-metal bombers with 200 m.p.h. cruising speeds. On the ground the emotional stress might cause minor errors in range computation.

The other active defense measure of course is the defense fighters—our pursuits, who if they are warned in time, can put up a certain degree of resistance. How much, depends on many factors. They cannot be considered as solid and certain a defense as a well-trained anti-aircraft unit on the ground.

A formation of Seversky P-35s—if we have them—or a defense line-up of Grummans or F4B-4s from a carrier deck would be very effective against a raiding group in the daytime—if they were advised in time to get "working altitude." The United States Army pursuit and Navy fighter groups must be considered among the finest from the standpoint of equipment personnel and training. Given reasonable conditions they could and should provide worthy defense in an emergency. By this, I do not mean that they would simply take the air and calmly shoot the enemy raiders down before they reached their objective. Those things simply do not happen. A few, out of our theortical dozen would get through. A few would either fight their way through, or use the aerial confusion to "sneak by." A number of the defensive fighters would be destroyed or disabled, but from all practical standpoints the raid could be halted or seriously blocked off.

Under night conditions, the situation would be more serious, because of the problems that arise with darkness. Formations must be flown wider and recognition is more difficult. Pursuit men flying at something well over 200 m.p.h. have their own troubles maintaining their own position, obeying certain laws of navigation and tactical problems and defense measures are automatically weakened. Just how much is hard to forecast, for of all the technical papers and books written on the subject of aerial warfare, few if any, have attempted to lay down specific laws on the plus or minus of night engagements. Most experts, indeed, pass it off with the statement that the same problems affect both the attackers and the defenders and therefore actually make little difference in the long run. They fail to state that owing to the lack of reliable information and actual records, no findings or data can be offered.

What little night-flying was done in the World War was practically all short-range bombing, in which planes approached their objective over one course and returned to evade interceptors by another. Few losses were registered through actual combat with defense ships or anti-aircraft fire. Most of them were caused by engine failure or the exhaustion of fuel. Comparatively little night bombing has been carried out either in Spain or China and so the experts still have no fundamental facts on which to base their opinions or suggestions.

If our hypothetical enemy raids the United States, it will be in comparatively small units and probably under daylight conditions. He will not care to work from aircraft carriers at night. Neither will he consider seaplane raids from cruiser catapults, except under the most favorable conditions—which means daylight. He will select a target worth his attempt which should make it easier for the defense forces to concentrate on the interception. Whether it be on the Pacific or the Atlantic coasts, the Mexican or Canadian border, it should be reasonably simple to figure just as what point the enemy is heading. To get the most effect from his bombs he will not only consider the military feature of his objective but also the value of its effect on the civil population. He knows that military points will have ground defenses (anti-aircraft guns and searchlights) and he will have to decide whether such an attempt will be worth the actual military gain or whether the safer course over undefended cities will bring a reward of moral destruction.

A glance back at war-air history discloses that except in few cases, raids on enemy soil are seldom aimed at military strong points. The records of the German Zeppelin raids on Great Britain are substantive proof of this contention for, of all the raids staged between 1914 (when there were two) through the years of the Great War, only a few missiles actually fell anywhere near military objectives. A study of Zeppelin crew histories substantiates the aforementioned suggestion that in most cases the airship commanders were satisfied to get "somewhere over England" and release their bomb loads the instant the home defense measures went into effect.

This program has been carried out in Ethiopia, Spain and in China. Practically all air raids in the past three years have been furtive thrusts into enemy terriory and a quick get-away with no actual attempt for accuracy or the carrying out of any preconceived plan. In the case where cities have been bombarded, the flyers have maintained some semblance of systematic operations *only when there has been no active defense set up against them.*

Taking all these items of evidence, the undeniable factors of raid bombing and active defense let us attempt to apply them again to the American scene. We have shown how and why an enemy force might attempt bombing raids on the United States and we have pointed

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out that the prime result would be—not to score a decisive victory or pave the way for a wholesale invasion; but to embroil the United States in a war far beyond her borders . . . beyond her wide-flung outer fringes of defense. Then all military conditions will be reversed and the United States will become the attacking side and our hypothetical enemy the defenders. In cold figures this means that the American forces will be required to squander man-power on attacks which usually mean 75 per cent of the actual losses in any engagement.

These are figures no general denies. The law of averages is always against the attacker as has been proven time and time again, and this is the big question that will be written on the walls of our buildings when enemy bombs begin to fall.

This is where the passive resistance of a nation comes in.

Air bombing has that strange reaction of charging the civil population with unbelievable ferocity sometimes labeled patriotism. The true defense—or resistance of the nation will be found within two hours after the first enemy bomb has dropped in New York, Chicago or San Francisco. Regardless of the defense that will be put up by the anti-aircraft gunners and the defensive pursuits, the future of the country will rest in the hands of the civil population when it first feels the thud of metal, the crash of shattered walls the singe of burning explosives and the stifling fumes of poison gas.

Will they say: "We have nothing to gain by going overseas after these international pirates. Let us stay here and defend our homes as best we can?"

That will be one form of passive resistance.

Another might take the form of: "Let's go get them. They can't do this to us. We're Americans and we take no smacking around from anyone. What's our Army, Navy and Air Force for, if we have to put up with this sort of thing?"

There will be many other stands, but most of them will be variations of these. Will it be better to swallow a certain amount of pride and concentrate on home defense measures and watch this enemy cut outside communications, destroy what is left of the Merchant Marine and eventually throttle every artery of foreign trade?

If the United States assumes a war of defensive-aggression, which means going after these enemies who have launched a raid, or a series of raids on American soil, it in all probability means the scrapping of most isolation and non-aggression policies. It might mean the acceptance of certain treaty obligations with the British Empire involving the use of certain Canadian ports, focal points and military bases. It might involve the use of the Singapore naval base and certain British islands in the Pacific. It might include the use of Bermuda or Jamaica or strategic points in the Bahamas. Or the situation may require certain basic rights in Mexico or southern California.

None of these ideas are particularly tasteful to the American public to whom the doctrine of isolation has been a national battle cry for years, but if one enemy air raid was staged on American soil, it might be the entering wedge that might lead to a welter of unpleasant international military pacts.

All of which perhaps is a long stride from the original theme of this article, but undeniable, nevertheless. What it all adds up to, of course, is that, if much of this is to be avoided, someone ought to make sure that there are enough anti-aircraft batteries and Sperry Directors to go around. Someone ought to be responsible for enough well-trained defense squadrons to prevent, or better still, assure the country that no such air raids will be attempted. There is no question in anyone's mind but that this country has the technical skill to develop these all-important organizations and the money to provide the equipment, but there are many reasons to believe that so far much more can be done. High officials of the general staff have said as much and it is quite obvious that all too long have we relied on the theory of geographic isolation. An enemy *can* raid the United States and the United States *can* put up a creditable defense, but *you* should make certain that there are enough of these defense agencies to go around.

We can't rely on this highly-publicized "secret" weapons the pseudo-scientific writers would have us believe are hidden away in some awesome safe in Washington. We do not believe there is anything in the way of an effective "death-ray" or a high voltage device that blanks out the ignition systems of gasoline engines. We accept the stories of "fog-cameras" for detecting battleships 25 miles out at sea in the spirit in which they are written, but we can't rely on their turning up in the perfection stage when the drums begin to roll.

We can only close with the repeated assurance that there is available in this country plenty of skilled men, the most effective anti-aircraft weapons and enough potential defense operatives to hold off any form of air attack from any side, but we are not quite certain that there are enough, and we can't assure you on the result of mass-hysteria should one bomber sneak through and demolish a row of unoccupied tenements.

END

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G-Men in the Air

(*Continued from page* 16)

tury had witnessed crooks traveling about a community or limited area in which their activities were restricted.

But all that has been changed today. There now are speedy automobiles—and airplanes. These two modern developments alone have widened both the field of acquaintanceship, and of activity for the criminal. To a degree, his old-time specialization has vanished. A law violator is no longer a safe cracker and nothing else. He is versatile and the whole nation constitutes his field of operation. He knows where he may secure assistance in his efforts, and also where he can hide out. He can operate as well on the east coast, as he can on the west coast. All he needs is a list of names and telephone numbers. With the aid of the airplane those distances are quickly covered. The thief who "pulls" a bank robbery in the east today can be spending his stolen money tomorrow in Los Angeles. A murderer in the middle-west can be sitting in a Broadway theater that same night.

So it is that crime detection must always be just a little speedier than crime. We must catch our man as soon after the crime as possible. Here, then, is the all-important role of the airplane. Speed always will remain the all-important factor in our operations. For that reason, we depend a great deal on the cooperation of local police authorities as well as that of the crime-conscious general public.

That is why there always is a line open—day and night—in the FBI headquarters in Washington. That is for *you* to telephone us from any section of the nation in case of a kidnaping, or other emergency.

END

The Man Under the Hood

(*Continued from page* 66)

Races. . . . The propeller threw a blade during the **Bendix Trophy** race and both Benny and Mike were critically injured. . . . Both, however, recovered and are in excellent health today. . . . Officials of the propeller company, meanwhile, wired some pertinent facts:

"MR. MULLIGAN WAS EXPERIMENTAL INSTALLATION ABOVE APPROVED RATING OF PROPELLER FOR RACING PURPOSES ONLY UNDERSTOOD BY HOWARD. IN ADDITION TO THIS HOWARD REFUSED TO PERMIT US TO MAKE THOROUGH INSPECTION OF PROPELLER BEFORE RACE. THE SUIT WAS SETTLED ONLY BECAUSE OF ORDER OF COURT HAVING CHARGE OF BANKUPTCY PROCEEDINGS OF OUR PREDECESSOR COMPANY IN ORDER TO CLEAR BOOKS."

* * *

That **American Airlines** deal for some **Boeing 307** airplanes is coming to a head—one way or another. . . . We mentioned it a couple of issues ago, but there has been a great deal of negotiation since then. . . . The **Boeing** people insisted on drawing up the proposed contract in such a way that caused **American Airlines** officials to backtrack a bit. . . . The details on which officials of the airline and the manufacturer could not exactly agree concerned minor changes that presumably might have to be made in the new ships after delivery. . . . That is, of course, provided such minor changes became evident after flying the ships in regular service. . . . **Donald Douglas** changed a lot of tails on his **DC-2's** and made several changes on his **DC-3's** without cost to purchasers when it was found that these changes were needed. . . . **American Airlines** and the **Boeing** people still are trying to reach some sort of agreement so that the order can be placed. . . .

* * *

If you will notice, the hydromatic propellers purchased by a lot of the airlines have been put only on **DC-3** airplanes. . . . The **DC-2's** are left with the original two-position **Hamiltons**. . . . **Transcontinental & Western Air** is considering the purchase of **Curtiss** electrical full-feathering propellers for all its **DC-2's**. . . . This step probably will mean the other lines will follow suit. . . . The **Army** has had the **Curtiss** propellers on a number of its airplanes, notably the PB-2A **Consolidated** fighters, and the reports are that it is a fine device.

* * *

The chiefs of the **GHQ Air Force** have been carrying a horrible secret around with them for months. . . . This is the confidential report made by the squadron flying **B-17** bombers from **Langley Field** on a tactical problem involving a long flight at sea. . . . The squadron was sent out to find the battleship *Utah* and drop a salvo of dummy bombs on her. . . . The Navy was quietly confident that (1) the Air Corps wouldn't find the ship at sea and (2) that the bombs wouldn't drop close enough to do any harm. . . . The Navy was *wrong* on both counts. . . . The squadron *did* find the *Utah*, and so many of its bombs made direct hits that the Navy hushed up the whole thing and ordered it kept secret under pain of supreme displeasure. . . . It was shortly after this affair that President Roosevelt came out with his pronouncement that aircraft could never sink battleships. . . . He knew about the *Utah* but it would never do for the Navy to admit that its $50,000,000 vessels could be sunk by a $200,000 bomber. . . . What makes it horrible for the Air Corps chiefs is the fact that they do not dare to tell the truth about their own weapons.

* * *

Because of this demonstration the Air Corps and the **Navy** have worked out an agreement for operation against an enemy fleet which might be approaching our shores. . . . The Navy is to do the scouting and observation work, and the **Army Air Corps** with its big bombers is to go out and do the actual bombardment. . . . The Army rightly contends that the Navy's aircraft are fine for over-water flying but they do not carry a bomb load large enough to make them formidable. . . . The fact that the agreement is in effect today indicates that the Navy agrees. . . . The Navy now is busy trying to get flying boats large enough to compete with the Army's land-based bombers.

END

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Radium Express

(*Continued from page 50*)

flight of 1,200 miles every week to service a prospecting party in the hinterland.

But this was small potatoes to this pioneer of the air lanes. He had an executive's job with Western Canada Airways but he changed his business suit for a fur lined parka and took to the skies in organizing the biggest aerial network in the world. Such remote places as Rottenstone, Reindeer, Baker, Great Slave, Great Bear and Muskox Lakes became his stamping grounds. His plane, a Fokker Super-Universal, clove the frozen air above Chesterfield Inlet on the bleak west coast of the Hudson's Bay. The grim Barren Lands fell beneath his speeding wings. The drab shores of the friendless Arctic Ocean re-echoed to the challenging roar of his motor. No land was too distant for him. From Labrador to the Yukon he laid the groundwork for the airlines.

He then took O. S. Finnie, director of the Northwest Territories, down the mighty Mackenzie River to Aklavik, 1,800 miles north. From here they turned west over the towering Rockies and landed at Dawson City, Yukon, after a non-stop flight of 742 miles. From here they went to Carcross, over Lac La Barge, made famous by Robert Service; over the notorious White Horse Pass, Skagway, Prince Rupert and then to Edmonton. Here he picked up an air mail superintendent and carried him through to Winnipeg—all this without any ballyhoo.

In 1929, Brintnell took a tri-motored Fokker and flew a government party from Winnipeg to Vancouver. They stayed in the coast city for the night and after an early breakfast they flew back to Winnipeg the same day. The distance is 1,400 miles. It took them 10½ hours. The same trip today with modern ships on the Trans-Canada air mail route takes seven hours.

That is a partial background of the pilot who really discovered the Eldorado gold mines. Is there any grounds for assuming that Eldorado is truly the richest radium mine in the world?

There certainly is. In January, 1938, more than one quarter of a million dollars' worth of radium, silver, etc., was produced at Echo Bay. There is an apparently inexhaustible supply of ore and bigger equipment will be taken in at some future date. During the coming summer, the schedule laid out for the big Bellanca, in addition to carrying the regular supplies, includes the transportation of more than one thousand tons of radium concentrates from Great Bear Lake to the railroad.

And all this came into being because an Arctic pilot happened to be glancing out of his cockpit while passing over the most barren country in the great northwest.

END

Peruvian Wings

(*Continued from page 58*)

with the course set for Iquitos, the jungle city 400 miles away.

There is, however, plenty of pleasure and profit immediately available, in winging over the Andes. Whether you are a tourist intent upon seeing the magnificence of the ancient Incan fortifications from the air, or an adventurer interested in the development of the uncalculated gold deposits of mountains that were old when Methusaleh was young, you will find the plane you want, waiting for you in Peru.

END

The Best or the Most?

(*Continued from page 21*)

that brings up the question of replacements. Would they ever be received, or would the enemy smash the aircraft and engine factories when hostilities started and so prevent or delay replacements for months and maybe years?

Several other questions would have to be answered. But the time was running short. "A general staff conference," announces the chief of staff, and in troops the four other air force general staff officers. To them the chief of staff presents the problem. "In ten hours I want your reports," he tells them.

And in ten hours he gets their reports. After several more hours he has coordinated all their findings and recommendations, showing the advantages and disadvantages of each of the two possible decisions. Then what does he do? He (that's me, the author, folks) presents the study to the Old Man. And the Old Man, the air force commander, calls in his chief of staff and says he; "Here is my decision. I want—" but we started out by saying that *you*, reader, were the air force commander. (The old Army game of passing the buck.)

So what would *your* decision be?

NOTE: *If your decision was in favor of quantity rather than quality, you were dead wrong. The old military crack about "gettin' there fu'stest with the mostest men" should read "gettin' there fu'stest with the bestest planes". Being second-best in air warfare means you're the loser. A smaller quantity of better planes pitted against a larger body of not-so-good machines would be able to deal such smashing blows in the first part of a war where the countries are close together, as in Europe, as to influence the war toward victory. When Jane's "All the World's Aircraft" judged the United States air forces as the best and most highly efficient of any in the world, they did so on the basis of our excellent military planes and training of personnel, although this country's air forces are about fourth in size among world powers.*

END

West Point in the Air

(*Continued from page 38*)

turns down the curving highway, and the checkered water tank of Mitchell Field disappears from sight behind the hills.

It is safe to say that many Air Corps pilots are born during this one short week at Mitchel Field, for many former skeptics change their minds about flying and determine to make the Air Corps their branch of the service upon graduation from the academy.

Civilians sometimes have the mistaken notion that only those cadets of highest scholastic achievement are chosen for assignment to Randolph Field. On the contrary, every graduating cadet is encouraged to pick the Air Corps. A physical examination is given in the spring and again in the fall to all candidates, and all those who can pass the rigid tests are assigned to Randolph Field. Therefore, under present regulations, the lowliest "goat" has as much chance to be accepted for flight training as has the highest ranking "engineer".

END

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Some Pilots Get All the Breaks

(*Continued from page* 54)

old Fokker toward St. Louis when the combination of gathering darkness and soft-coal smoke in the vicinity of that dusky city blotted out the particular part of the landscape he wanted to see. Of course he had just completed a long flight in a plane that carried only a small supply of gas, so he found himself with a lot of airplane on his hands and no place to put it. He had time to get plenty of altitude and that was all. The WPA hadn't started building airports yet and there were none in sight. When the engine stopped ticking he got ready for his second jump, but it seemed a shame to let such a big airplane go nosing about without a guiding hand, and he remembered also the resolution he had made on that rocky hillside in Texas—that he would never again come down "by hand".

"Parachutes are fine, but don't let anybody tell you they let you down easy, especially in a wind. I still had weak arches from that first jump and I weighed more than ever. Besides, there were some little towns around there and I didn't like the idea of that big Fokker trying to park in one of them."

Straining his eyes in the murk as he neared the ground, Charley was able to pick out an open space and that was where he put the plane. His judgment was so good that all he needed for getting out the next day was a few gallons of gasoline. But after that he started smoking cigars, so the experience was an expensive one after all.

The next serious episode also turned out well, but it was actually the most troublesome of all. I know, because I was Charley's co-pilot when it happened. We were crossing the Alleghenies in a "tin-goose" loaded with passengers when the right motor went completely dead. We had a heavy load of gas also, and our sheet-iron chariot showed little inclination to hurdle those mountains with the engines that were still running, so with both feet on a rudder-pedal to keep the good wing-motor from taking us around in circles I smiled sweetly at the passengers until Charley finally got squared away for a perfect landing on a hillside.

The passengers were soon on their way to civilization, but Charley and I hibernated with the neighboring farmers for days and days while awaiting the arrival of a new motor. It finally arrived along with a blizzard, but we were so anxious to leave by that time that we helped change it in the open zero air.

Charley's next run was South. The temperatures were better, but his luck was the same: a single engined transport let him down into an Alabama cotton patch. In getting out of the small field he left some wing fabric hanging on a tree, but he brought the plane home.

On returning from another southern trip he pointed with pride to a neat bullet hole through a wing. He supposed a turkey hunter on some Tennessee mountain-top had seen him coming from the north and decided to test his shooting ability on another "damn Yankee."

Back on an eastern run, he was crossing the mountains again when his radio went out and a line squall jolted his compass off pivot. He got above the clouds and managed to keep on flying in the same direction until he was sure the mountains were behind him, then he came down for a look at the ground. But there was no ground to be seen—everything was water. Charley committed himself to a direction he thought was west and hoped to pick up the Atlantic coastline before he ran out of gas. He still had a little gas left when he sighted land and a landing field at about the same time, and learned that he had not been flying west at all, but north—right up the middle of Chesapeake Bay.

Even when things happened to other people, Charley's luck would not desert him. On one occasion when we were both at a southern airport I took a ride with a local pilot only to have the engine quit as we rose from the field. The pilot aimed for a clearing in the nearby woods and made a perfect landing, so quickly that we scarcely had time to become frightened. But Charley was horrified to see us go down in the woods. Remembering his experience in Texas, he ran toward the expected wreck without pausing to remove his heavy flying suit, until he got overheated and violently sick.

On a Western run the jinx pursued him until his single engine blew a spark-plug, but he found the only large wheat-field in the county and again he was able to fly his plane out without damage.

A superstitious person might explain the following event by saying that the fates were not through with Charley and that they were determined to break his resolution not to jump a second time. In that case it must also be true that the fates love to ambush pilots in the mountains, for that was where they struck hardest. However you figure it, the cards were certainly stacked against Charley the next time he started East in a small open plane. A broken valve punctured a piston head and the cylinder began pumping hot oil into the slip-stream. The plane and windshield were soon blackened by the gummy stuff, in spite of the fact that the violently vibrating airplane seemed to be trying to shake it off. But Charley was in no mood to be shaken loose as long as the plane was still in one piece, and again he headed for a pasture. In order to see ahead he tried to peer around the oil-covered windshield and his goggles were soon covered with the same sticky film. He was already gliding down into a valley and he simply had to see something, so he pushed his goggles up and tried to shield his eyes with his hand, but it was no use. A sudden, heavy spray of hot oil blinded him completely. There was scarcely time to think about his weak arches as he piled out. Blinded as he was, he could not even try to protect them when his parachute opened and he struck earth a few seconds later.

Fortunately, there was little wind in the valley and the parachute did not drag him. He rolled over on the grass, sat up and tried to recover his vision but he could only see enough to worry him until he decided the large objects moving about nearby were only cows. Soon rescuers arrived and a doctor restored his vision but nobody could help his sore feet.

The plane had been all set for a landing when he decided to precede it on foot, and it almost completed the landing without help before striking a ditch and

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smashing itself just enough to crush Charley's traveling bag and clothes.

This time the plane could not be flown away but Charley did not brood long over his strained arches, for another pilot came after him in a few hours and he climbed in for the trip home. In taking off, however, the relief pilot found the field softer than he had estimated and a fence post removed a section of the lower wing.

"I had never been so discouraged," Charley complained on his return, "as I was when we kept on climbing in spite of that broken wing. I knew we would have to get down somehow and I figured we would have to jump. The pilot did a good job in bringing the plane home but I didn't appreciate it because my feet were hurting all the way. After we got here he fooled around a while, trying to make sure the plane was safe to land. I think I would have tried it myself if he hadn't. They've got to make these emergency chutes bigger before I start making more than one jump a day."

It seems hardly fair that the only lasting result of all Charley's aerial adventures should be a pair of weak arches, the occupational complaint of patrolmen and floorwalkers. But the record number of ups and downs Charley encountered in his profession were much harder on his clothes than on him. On two occasions when his planes were damaged his wardrobe suffered the same fate. And once we were ferrying some planes to the West Coast the door to the baggage compartment of his plane opened in some manner just after takeoff and allowed his suitcase to fall out. Unfortunately, his cash was also in the suitcase. But again Charley's luck was almost as good as it was bad, for he returned over the same route and found his suitcase lying near the airport boundary—cash and all.

But even after his second jump Charley was not through with trouble. His next experience with a failing engine did not force him to jump and he succeeded in landing the plane. But the engine went to pieces on the way down and blocked his vision again. He made a perfect landing by looking out to one side but it happened to be on the wrong side of a ditch so the result was about the same as if he had stuck his face out for another oil bath, except that neither his face nor his feet were damaged. The plane needed considerable fixing, but all Charley needed was a glass of beer. After this event, he decided to take up pipe-smoking.

It would have been difficult to think up a new experience for Charley, in the way of unavoidable mishaps to airplanes; and he had even gone over several of the more common ones more than once. But fate or chance, or what-have-you, must have been saving one for him. It happened in the mountains, of course, but with another pilot handling the plane; a most peculiar kind of forced landing it was, for it happened before the plane could take off—yet the plane left the ground and failed to return. It sounds complicated but it was actually too simple. They were trying to take off crosswind from a one-way field bordering a river. The big plane veered, dropped over a bluff, bounced once and plopped into the water. And again nobody was damaged. The plane was fished out and repaired.

That occurrence rounded out Charley's list of unwilling descents to everything from a hillside on a western desert to a river in the eastern mountains. But it was not the last. The last was in the West again, on the bed of a dry lake in the mesquite country, and it bears out the suspicion that Charley's luck is improving, for again another pilot was at the controls. They were clipping along nicely in a new bi-motored transport when one of the motors pooped. They should have been able to continue on the other motor except that for some unexpected reason the propeller refused to shift to low pitch. So they came down gradually to a landing which broke a few mesquite trees on the ground, but nothing on the plane. The plane was spotted, help arrived while they were out looking for it, and after a while Charley flew away from another unpredicted descent with nothing to show for it but a sunburn.

I believe Charley has been flying in comparative peace for some time now, and he certainly deserves it. But I suppose he is still worried—still worried because he thinks his hair is coming out too fast and he may start getting bald before he is 40.

Even more unusual than the fact that all this occurred in a comparatively short space of time is the fact that Charley was not flying rickety crates, but good equipment.

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That Man Weems

(*Continued from page* 31)

days. It wasn't possible to take the sextant, get your position from the sun or stars, then check your findings with the map to determine just how far off your proper course you actually were. The marine sextant was useless for his purposes; used on the bridge of surface liners, it depended on a clear view of the horizon for a proper reading.

So the only course open to the NC-4 crew was dead reckoning. They knew that, wrong course or not, the error had at least been consistent and that the ship had been flying in a straight line, and not wandering over the Atlantic.

Captain Read examined the compass and determined the direction in which he deviated. He knew the exact distances between the guarding destroyers and, consequently, the number of miles between the third ship and his point of departure.

He held the lumbering seaplane on the wrong course until he could determine whether he had actually flown the distance from the take-off point to the third destroyer, then changed course at an angle determined from a comparison of the correct and incorrect compass readings. It worked—the guard ship appeared at the proper place and the flight was continued successfully.

Commander Weems knew, when Captain Read explained all this to him, that such a method was not particularly accurate, and was, to say the least, certainly cumbersome. So he decided to figure out a better way of navigating an airplane.

He was then an instructor in navigation at the Naval Academy, and the time was 1924. His first major contribution to the science came about through his discovery, in the academy's library, of an altitude table prepared by the Japanese in such a way that the data contained in almost two thousand pages of an American manual were presented in the Nipponese pamphlet in about fifty.

He copied and improved the Japanese work, rearranging the tables along their lines, and published the "Line of Position Book," now standard equipment for navigation courses, through the cooperation of the Naval Institute.

Next he turned his attention to the watches all navigators use in computing their positions. These watches have to be accurate, because calculations must be made to the fraction of a second, but heretofore only the minute and hour hands could be adjusted.

Commander Weems worked out a watch whose seconds-dial face could be turned to any desired point, so that exact readings could be determined at will. For instance, to put the second hand on zero, all the wearer of the watch had to do was to give the dial a twist.

That is the sort of wrist instrument which Neil Richardson now wears two examples on one arm, leaving him wide open to the frequently made remark that he looks like a strolling jewelry peddler.

Commander Weems was transfered from the naval academy to the Navy air base at San Diego, where he worked out a system whereby an aerial navigator could determine his position from celestial obeservations in less than two minutes, cutting down the previous time by 13 minutes.

This was an important contribution. A navigator whose airplane is traveling, say, three miles a minute, has to work against time. After 15 minutes of reckoning by the old method, he would find that he was 45 miles from the point where he began working out his location.

By this time the various Weems contributions were beginning to attract the attention of aviators who flew off the beaten path. Lincoln Ellsworth was the first. Then preparing for one of his transpolar flights, he came to San Diego in recognition of the Weems' system, and asked the commander for instruction and advice.

Now here's a strange thing that illustrates the obliviousness of the American public to everything and everyone except its current hero:

Colonel Charles A. Lindbergh, about a year after his flight to Paris, decided to make a series of flights around the country. All of you know the details of that "barnstorming" jaunt. The famous pilot came to San Diego and asked Commander Weems to accompany him as navigator. The naval officer took leave of absence, and made the trip. How many of you who mobbed the airports to welcome the romantic Lindbergh knew that Commander Weems was in the airplane with him and was doing the navigation? Probably not one in a thousand; the Naval officer, who, in my estimation, has contributed a whole lot more to aviation than Charles Lindbergh ever did or ever will—and I'm not trying to disparage his feats—received no more attention than if he had been the compass in the Lindbergh cockpit.

I don't mean to imply that Colonel Lindbergh himself ignored his companion. Far from it. On the contrary, he recognized the genius of the ace navigator, and drank it in as thoroughly as only a man like Lindbergh can.

Lindbergh's flight across the Atlantic to Paris had been made on dead reckoning alone. When the visibility was poor and the ceiling low—and it was most of the time, you remember—he "hedge-hopped" the waves for hours at a time to calculate the speed of his drift.

When he and Mrs. Lindbergh made ready to fly together to Europe, the colonel spent about a month studying under Weems. He learned most of his celestial navigation from him and was, Weems says, "the best informed man in the world on aviation, and the aptest pupil I ever had."

Colonel Lindbergh's hours of study under Commander Weems were well spent. "His flight with Mrs. Lindbergh from Bathurst, Africa, to Natal, Brazil," says another writer, "is considered today the classic example of perfect flying by celestial navigation."

Recognition slowly began coming to Commander Weems, who was approaching the time when he would retire from the Navy. He won a gold medal from the Aero Club of France and a trip as a guest of General Italo Balbo, who led the flight of Italian seaplanes to Chicago from Rome, to the congress of transoceanic flyers held in Rome six years ago. The award was made in recognition of his book "Air Navigation." He was the only delegate to the congress who was not a pilot nor had flown an ocean.

Then, five years ago, he was retired from active duty, and returned to Annapolis, the scene of his graduation into the ranks of the Navy 21 years before. He had long cherished the idea of opening his own school to teach expert airmen his own methods of celestial navigation.

He did so. Now he has an office on the second floor of his garage. Next door is the dormitory for his pupils, a reproduction of a ship's cabin, complete with bunk and portholes.

Mrs. Weems serves as hostess and part-time secretary, and recently he employed a full-time secretary and added two members to the one-man faculty.

One is Colonel Alexis Illyne, formerly of the Imperial Russian Air Force, and the other is Lieutenant-Commander L. H. McDonald, formerly an instructor in navigation at the Naval Academy.

Of all his pupils—including Harold Gaty, whom he says is "one of the best aerial navigators in the world"; Harold Bromley, Jack Lambie and Dick Merrill, and Captain Alex Papana, of the Rumanian air force—only Fred Noonan, who was a part-time student, was lost at sea.

Commander Weems says that Noonan and Amelia Earhart did not overshoot Howland island, a theory that is generally accepted by the public, but actually must have run out of gasoline before reaching the tiny pin-point of land. "Noonan had been flying for Pan American for many years," he asserted, "and it was all in his day's work to hit smaller islands than Howland square on the nose."

Although the Weems school ordinarily has five or six students studying by mail from all parts of the world, most of the famous flyers come to Annapolis and receive personal instruction for a few weeks. Any flyer of ordinary intelligence and with a high school education can learn the principles of aerial navigation in from three weeks to a month, the master believes.

So that is why Fred Noonan sat down and described in detail how he went about navigating the clippers across the Pacific, related his problems and how he overcame them, to this retired naval officer.

END

Tapered Wing Layout

(*Continued from page 60*)

.0905

.290

.522

5.2490 inches above chord line (or approx. 5¼").

Then for the lower point, taking values from Table of Multiples and adding:—

.0596

.348

.522

.290

3.4568 inches below chord line, (or approx. $3\frac{7}{16}$" plus)

Since the measurements result in decimal fractions, it is well to use the decimal equivalents of an inch as follows. advancing by $\frac{1}{32}$". (All measurements can be made with an ordinary scale or rule with inches and divisions thereof.)

DECIMAL EQUIVALENTS OF AN INCH

$\frac{1}{32}$—.0312	$\frac{17}{32}$—.5312
$\frac{1}{16}$—.0625	$\frac{9}{16}$—.5625
$\frac{3}{32}$—.0937	$\frac{19}{32}$—.5937
$\frac{1}{8}$—.1250	$\frac{5}{8}$—.6250
$\frac{5}{32}$—.1562	$\frac{21}{32}$—.6562
$\frac{3}{16}$—.1875	$\frac{11}{16}$—.6875
$\frac{7}{32}$—.2187	$\frac{23}{32}$—.7187
¼—.2500	¾—.7500
$\frac{9}{32}$—.2812	$\frac{25}{32}$—.7812
$\frac{5}{16}$—.3125	$\frac{13}{16}$—.8125
$\frac{11}{32}$—.3437	$\frac{27}{32}$—.8437
⅜—.3750	⅞—.8750
$\frac{13}{32}$—.4062	$\frac{29}{32}$—.9062
$\frac{7}{16}$—.4375	$\frac{15}{16}$—.9375
$\frac{15}{32}$—.4687	$\frac{31}{32}$—.9687
½—.5000	1—1.000

On Fig. 4 will be noticed the locations for wing spars at 15 and 65 per cent which is a good average spacing. The line that the spars will take in the plan view are shown in Fig. 1.

To the novice, this procedure may seem too detailed and laborious, but when put into effect the builder will realize that it is actually very simple.

END

Gas Model

(*Continued from page 68*)

shape, they are next cemented into position. Do not omit any of the bracing between the ribs as this is necessary to strengthen the ribs. The upper wing panel is built as one complete unit. The lower wing panels are cemented into the lower part of the fuselage after they have first been covered.

The entire model is covered with a good grade of bamboo paper. In applying the paper to the framework, ordinary model airplane dope will not do, ordinary cement, thinned out slightly makes an excellent paper cement. In order to obtain a nice covering job, see that all wrinkles are removed. Do not stretch the paper so tightly over the frame that it will have a tendency to pull out of shape.

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Ice Cap Pilot

(*Continued from page 40*)

legendary ice worms, traditional food for cheechakos and tourists.

Few pilots ever get to see a sight of this sort. Flyers of the Pacific Alaska Airways transports which fly farther north over the edge of the Ice Cap from Juneau to Whitehorse, on their way to Fairbanks, are among those who do, however.

From the vantage point of Barr's plane, along the Juneau-Atlin route, the Taku glacier, whose ice-walled front is familiar to many tourists and steamship skippers, appeared as a river of ice. Its birthplace was on the edge of the ice "sea". Peaks of mountains in the coast range appeared as islands in the "sea".

Several emergency landing fields could be utilized along the edge of the ice field, one of them being near the Devil's Paw, a precipitous peak close to the international boundary. This, of course, would be on a field of ice which could not be improved much by human machinations. Barr has not had occasion to make a landing on the Ice Cap, as he prefers flats and bars of the Taku river for any forced landings.

Atlin, metropolis of 250 to 500 persons of Northern British Columbia, is a mining center. Its population, fluctuating by seasons, embraces those gold seekers who dig and sluice the gravels of the many creeks winding eastward from the little town and the great lake at the edge of which it is built. Back in 1898, Atlin was on the route of gold seekers who were pushing northward to Dawson and the Klondike by way of the inland route. Just east of Atlin is the ghost town of Discovery, born in a little gold boom of the Atlin creeks in that vicinity.

Gold production is still proceding ambitiously, much of it being financed and managed by Americans, and when the writer last visited there he photographed two nice looking nuggets of 44 ounces and 30½ ounces each.

Vegetables are at a premium, and freight rates by way of the White Pass and Yukon route via Skagway and Lake Bennett are tremendously high. Though competing against a large transportation system, Barr was finding a ready response from the miners for perishable goods and other freight. Spring and fall were his best passenger-carrying periods, providing bad weather did not intervene, as it was then the transient miners were either going in or out of the Atlin district.

His problems were many and varied, however, one of them being the necessary transport of oil and gas into Atlin for return trips. Another was the Customs, and another was the small field at Atlin. But the Ice Cap flyer had many friends —which was most important of all.

Atlin was familiar country to him, and it was on Lake Atlin and the area just south of it where he flew for a number of years with Canadian ships.

Typical of Barr and forerunner of many of his dramatic experiences over the Ice Cap area was his repairing of a Gypsy Moth one winter on a lonely lake south of Lake Atlin. The little plane's motor began to sputter during a flight to a trading post farther south, so it was a case of landing promptly on the frozen surface of the big Canadian lake. The only cabin on the lake—probably the only cabin for many miles —stood out like a sore thumb on the western shore. He taxyed up to it with the hopes of enlisting the trapper's aid and obtaining a warm meal and a night's lodging.

But the cabin was deserted, and what was more important just then, there was nothing around the place worth eating. Barr was exploring the place when he heard a crash outside on the lake, and he hurried out to find that a sudden gust of wind had turned his little Moth completely on its back.

It looked pretty serious after that. There was a damaged landing gear and cracked ski, a broken wing tip and aileron, two broken struts, plus other tears and breaks. To make things look just a little more dismal at the moment, some wolves howled loud and long on the opposite side of the lake.

"Looks as if I'm not the only hungry one around these parts," Barr concluded to himself.

To prevent further damage, Barr tied down the plane securely. A good night's sleep helped out some, and the next morning he set to work in the sub-zero weather righting his plane and hopefully repairing and improvising as well as possible. If he were to worry much, on top of all the other handicaps, he might never get out of the jam he was in, he decided.

New struts were made from a sapling, with some wire from the cabin aiding in the process. The broken propeller was trimmed off evenly on the other end so that it balanced, and the ski was doctored up with reinforcements. As luck would have it, some old thread and a piece of a needle was found in the cabin and cloth was patched in to make the wing covering whole. All in all a lot of pieces of wood and cloth from the cabin and its vicinity went on the little plane. Two days of cold, hungry work were necessary to complete the job to his satisfaction.

The residents of Atlin marveled at the repairing job when Barr landed there the third day, for his job had been a successful one in every way. Even Barr was a little bit astonished at his accomplishment, but he forgot that entirely when one of the residents announced that soup was on!

Ingenuity, in addition to stamina and fortitude, are requisites of a northern flyer, and Lucien Barr has demonstrated its value in the course of his flying experiences. His exploits will provide an interesting chapter in the history of Alaskan aviation.

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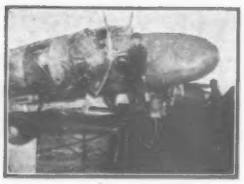

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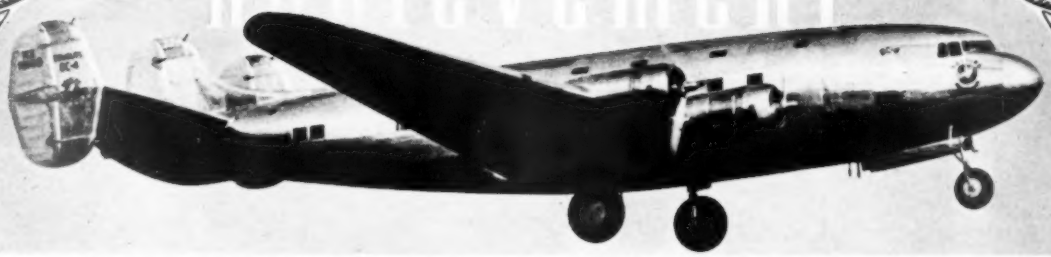

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